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AN EVALUATION OF COAL CLEANING PROCESSES AND TECHNIQUES FOR REMOVING PYRITIC SULFUR FROM FINE COAL

A Report

to Environmental Protection Agency
Office of Research and Monitoring
National Environmental Research Center
Control Systems Division
Research Triangle Park, N C. 27711

by Bituminous Coal Research, Inc.

Contract No. 68-02-0024

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A southern Appalachian coal was added to the coals slated for comprehensive two-stage beneficiation to further define this method for removing and concentrating pyrite from steam coals. Particular attention was focused on the use of the high-gravity middlings fractions in line with the total steam utilization concept. Eight geographically diverse bituminous coals, used basically for power generation, were collected and subjected to two-stage cleaning studies. The purpose was to determine the suitability of a concentrating table for deep cleaning coals at a topsize of 30 mesh. Comprehensive two-stage concentrating table cleaning is one of the most effective means for removing pyrite from fine sized coal. This particular sequence of coals, however, did not respond in the manner expected from previous washability analyses. Since the 1.60 float composite was consistent with the ABC Zone composite, the table was apparently operating properly. The projected sulfur reductions, however, were not realized. In the 3/8 inch x 0 run, high quantities of fine clay tended to obstruct efficient zone classification but the secondary pulverization and recleaning should have facilitated sulfur release. The Bakerstown and Lower Kittanning coals showed the most favorable potential for wet table beneficiation. Sulfur reductions achieved would greatly alleviate the load placed on boilers and stack scrubbers in plants using these coals for power generation. Power plants presently burning raw coals would benefit by washing, not only from the decided decrease in sulfurous emittants but also in the higher Btu/lb calorific content and substantially reduced slagging potential.

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BITUMINOUS COAL RESEARCH, INC.
SPONSORED RESEARCH PROGRAM

AN EVALUATION OF COAL CLEANING PROCESSES AND TECHNIQUES FOR REMOVING PYRITIC SULFUR FROM FINE COAL

Report for the Period May 1971 - March 1972
(BCR Report L-464)
April 1972

I. INTRODUCTION

A. Background

During the combustion of fossil fuel, sulfur oxide compounds are formed and released to the atmosphere. Where it is feasible to physically remove pyrite from coal in significant quantities, the amount of sulfur oxide produced from coal firing can be reduced.

A review of the literature indicated that little information exists relative to the washability of coals mined primarily for use in power generation. To eliminate this deficiency, the Environmental Protection Agency had awarded contracts to the United States Bureau of Mines, the Illinois Geological Survey, and Commercial Testing and Engineering Company to develop washability data on selected steam coals.

The washability studies were unique in that they were specifically initiated to define pyrite liberation at various stages of crushing and grinding. Previous studies had concentrated on developing washability data from sized coal fractions as-mined so the proper sized splits could be made and the proper cleaning equipment and separating gravity released.

On June 1, 1967, Bituminous Coal Research, Inc., was awarded contract No. PH 86-67-139, to develop additional data on selected coals.

The objective of the initial work undertaken by Bituminous Coal Research, Inc., was twofold; first, to develop washability data on finer sizes of coal, and second, to evaluate coal cleaning methods and techniques for removing pyritic sulfur from the fine-sized coal. From BCR's previous work on pyrite removal from finely sized coal, two size consists were of paramount interest in the Phase I washability studies.

The first was the 30 mesh x 0 size. This range approximates the lower limit in coal sizing that would contain pyrite particles typical of a utility pulverizer's recycle load. Recycle load here refers to the pulverizer product which is either too coarse or too heavy to report to the pulverizer classifier. This recycle material might conceivably be diverted from the utility pulverizer, wet-cleaned to remove the pyrite, and, after dewatering, reinjected with the feed to the pulverizer without thermal drying.

The second size range of interest was that having 60 to 80 percent minus 200 mesh, which constitutes a coal's "as fired," or pulverized coal (p.c.), grind. At this stage of pulverization, insofar as the coal's present utilization is concerned, maximum theoretical pyrite liberation occurs. Consequently, the maximum degree of potential pyrite removal has been attained with each coal's p.c. grind.

The Phase II evaluation of coal cleaning methods and techniques was conducted at two size consists; namely, 3/8 inch x 0 and 30 mesh x 0. A two-stage operation was adopted to maximize pyrite removal from selected coals using conventional coal cleaning equipment.

Pyrite concentrations were obtained from the 3/8 inch x 0 refuse following pulverization to a uniform 30 mesh topsize. A portion of this material was further reduced to a 60 mesh topsize and reprocessed. The main objective of this research was to produce a high-grade pyrite concentrate. This could be used as feedstock to a sulfuric acid plant or, in combination with high-Btu refuse from either the coal cleaning or pyrite concentration steps, for a specially designed, non-polluting, high-sulfur combustor.

Effective utilization of high-Btu refuse fractions would, by maximum use, enhance the economic potential of a coal.

The results of the work completed during the calendar year 1969 were reported to the National Air Pollution Control Administration in BCR Report L-362 dated February 1970, entitled, "An Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal," Contract No. PH 86-67-139.

The work completed in 1970 under Contract No. CPA 70-26 was reported under the same title in BCR Report L-404, submitted to the Environmental Protection Agency in April 1971. The current research is sponsored under EPA Contract No. 68-02-0024.

B. Objective

The basic objective of this work did not differ significantly from the earlier studies.

The scope of the current research, however, was modified by the deletion of the Phase I washability studies concerned with extending existing data to 30 mesh x 0 pulverized coal (p.c.) grind sizes of selected steam coals.

In its stead, a southern Appalachian coal was added to the coals slated for comprehensive two-stage beneficiation to further define this method for removing and concentrating pyrite from steam coals.

As in the previous report period, particular attention was focused on the use of the high-gravity middlings fractions in line with the total steam utilization concept.

C. Approach

Eight geographically diverse bituminous coals, used basically for power generation, were collected by BCR personnel and subjected to two-stage cleaning studies under Phase II of the current contract. The purpose was to determine the suitability of a concentrating table for deep cleaning coals at a topsize of 30 mesh. Each coal was rough cleaned on a No. 14 concentrating table (1/4 commercial size) at a 3/8 inch topsize to remove the obvious impurities. Zones A, B, and C, constituting the clean coal fraction, were combined, crushed to a topsize of 30 mesh, and recleaned with this concentrating table.

In the pyrite beneficiation studies, the raw material for testing was obtained by accumulating the heavier gravity Zone E refuse from the rough cleaned 3/8 inch x 0 coal on the quarter-size (No. 14) concentrating table. This heavy refuse was pulverized to minus 30 mesh and further concentrated using a 15-S metallurgical concentrating table. The 15-S table has approximately one-fourth the surface, or cleaning area, of the No. 14 coal cleaning table.

To simulate the reclamation of recycle product that had been further reduced in size to increase pyrite liberation, the middling Zone D material from cleaning the 30 mesh x 0 on the 15-S table was collected, pulverized to minus 60 mesh, and recleaned on the 15-S table. These pyrite beneficiation studies were combined under Phase II studies to establish the Coal Cleaning and Pyrite Beneficiation Phase.

Numerous high-sulfur, high-ash fractions containing significant quantities of combustible material were collected from the concentrating table tests and analyzed. Resultant data permitted an initial evaluation of the use potential of these fractions in a high-sulfur combustor. Tests for calorific value, ash fusion, and ash analysis by spectrography introduced under Contract 70-26 were continued in this program. These reflect the increased importance of determining the combustion and ash characteristics of the high-ash, high-sulfur fractions having potential for use in a high-sulfur combustor.

II. DISCUSSION OF PHASE I EVALUATIONS

This work was discontinued under the existing contract. Funds allocated for this work were used to evaluate one additional coal under comprehensive two-stage Phase II beneficiation.

III. DISCUSSION OF PHASE II EVALUATIONS

A. Test Procedure

1. Coal Cleaning on the No. 14 Concentrating Table: Eight coals were selected for the modified Phase II, Coal Cleaning and Pyrite Beneficiation Tests, a schematic of which is shown in Figure 1. Each coal was rough-cleaned at the 3/8 inch x 0 size consist on the No. 14 concentrating table to remove the obvious refuse prior to further size reduction. Figure 2 shows typical characteristics of the material reporting to the various zones collected from the concentrating table, and the analyses performed on the subject fractions.

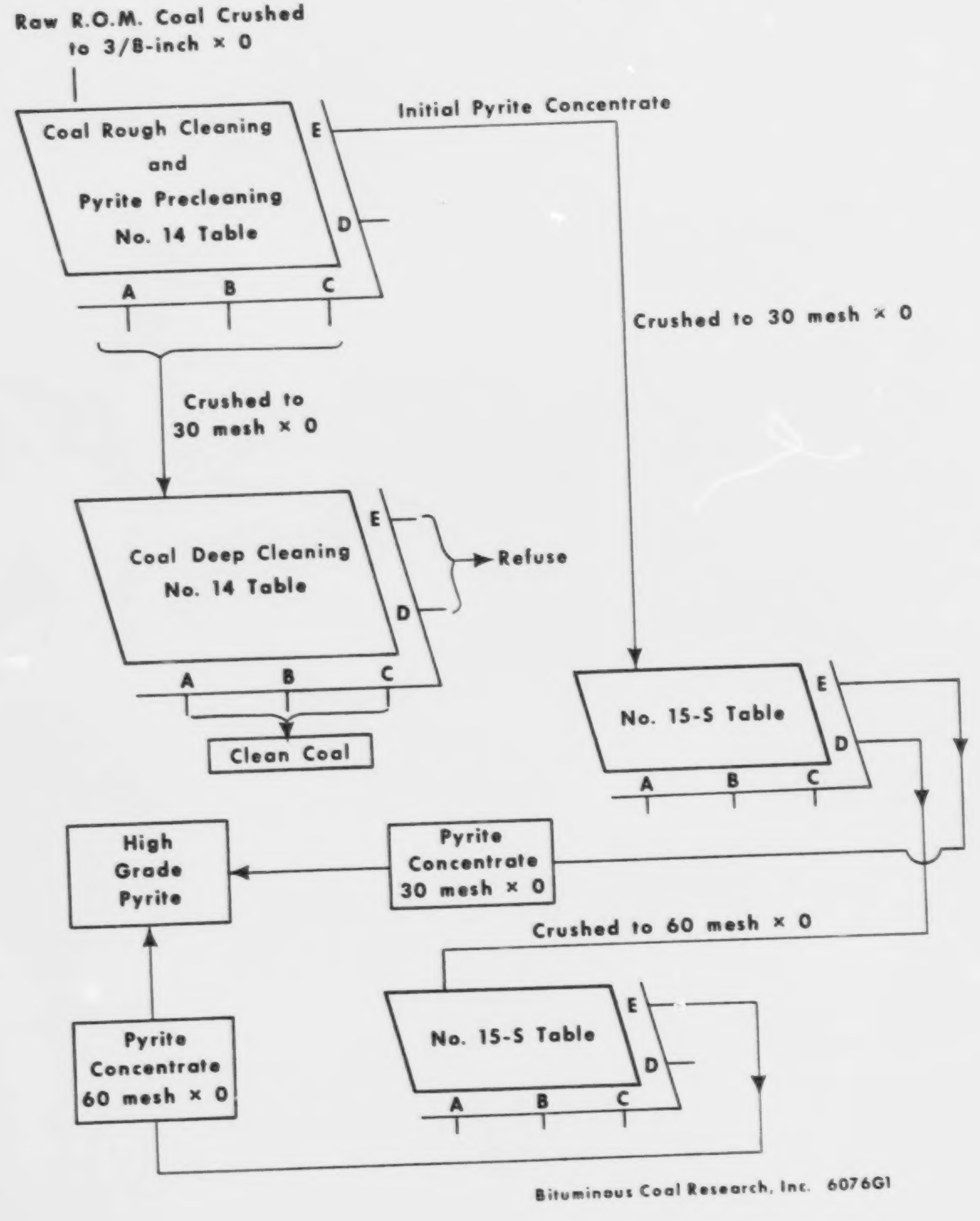
In the 3/8 inch x 0 rough cleaning, some of the high-carbon Zone D refuse fraction, which is normally discharged in actual cleaning plant practice because of its high ash content, was combined with Zone C material for further processing. It is from this high-carbon refuse fraction, together with the high-ash coal normally reporting to Zone C, that significant additional pyrite liberation and removal can be obtained through size reduction and recleaning.

The rough cleaned material obtained from Zones A, B, and C was pulverized to 30 mesh for a second 5-zone separation on the No. 14 concentrating table.

Table 1 shows the size consist of the feed material for the 3/8 inch x 0 and the 30 mesh x 0 concentrating table tests on the Bakerstown coal (BCR Lot No. 2856), while Figure 3 presents the cumulative data in graphical form.

Table 2 shows the ROM chemical analyses of the Phase II coals tested under this program.

2. Pyrite Beneficiation on the No. 15-S Metallurgical Concentrating Table: The Pyrite Beneficiation work (formerly Phase IV) was effected using a smaller concentrating table, designated as a 15-S, or metallurgical table. This table has one-fourth of the cleaning area of the quarter-sized table (No. 14) being used in the coal cleaning studies and one-sixteenth of the area of a commercial coal cleaning deck. The smaller metallurgical table was set up with five sampling zones, paralleling the arrangement for the larger coal cleaning table.


Raw R.O.M. Coal Crushed to 3/8-inch × 0
Coal Rough Cleaning and Pyrite Precleaning No. 14 Table
E
D
A
B
C
Initial Pyrite Concentrate
Crushed to 30 mesh × 0
Crushed to 30 mesh × 0
Coal Deep Cleaning No. 14 Table
E
D
Refuse
A
B
C
Clean Coal
No. 15-S Table
E
D
A
B
C
High Grade Pyrite
Pyrite Concentrate 30 mesh × 0
Crushed to 60 mesh × 0
No. 15-S Table
E
D
A
B
C
Pyrite Concentrate 60 mesh × 0

Bituminous Coal Research, Inc. 6076G1

Figure 1. Flowsheet for Coal Cleaning and Pyrite Beneficiation Tests

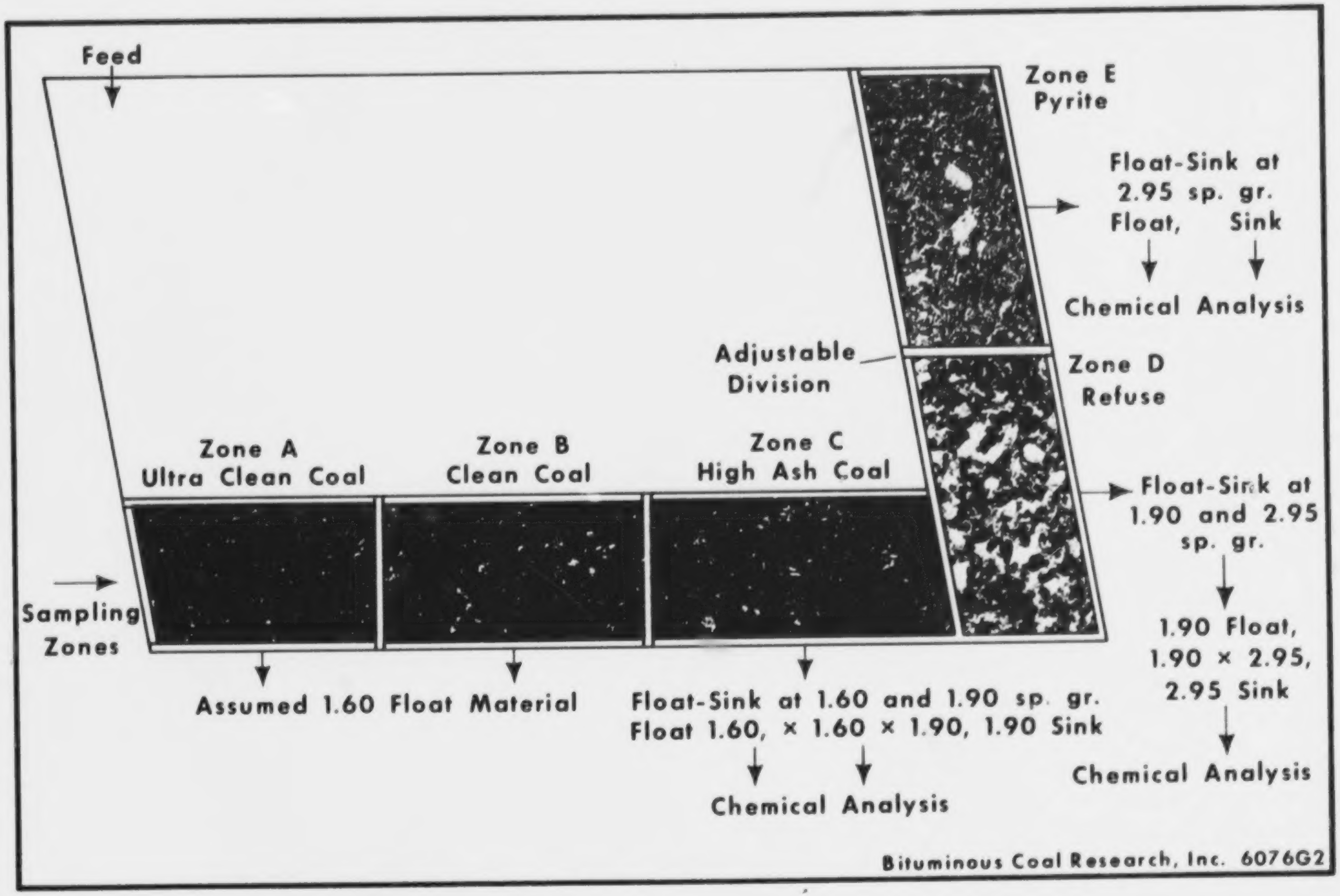

Feed
Zone E
Pyrite
Float-Sink at
2.95 sp. gr.
Float, Sink
Chemical Analysis
Adjustable
Division
Zone D
Refuse
Zone A
Ultra Clean Coal
Zone B
Clean Coal
Zone C
High Ash Coal
Float-Sink at
1.90 and 2.95
sp. gr.
Sampling
Zones
1.90 Float,
1.90 × 2.95,
2.95 Sink
Assumed 1.60 Float Material
Float-Sink at 1.60 and 1.90 sp. gr.
Float 1.60, × 1.60 × 1.90, 1.90 Sink
Chemical Analysis
Chemical Analysis

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Figure 2. Sampling Flow Sheet for Concentrating Table Tests

TABLE 1. SCREEN ANALYSIS OF A SAMPLE COAL - BAKERSTOWN SEAM

Raw Run-of-mine Coal Crushed To 3/8 Inch x 0

Screen Size	Weight Percent	Cumulative
Plus 1/4"	9.3	9.3
1/4" x 6 M	23.5	32.8
6 M x 12 M	21.2	54.0
Minus 12 M	46.0	100.0
Total	100.0	

Zones A, B, and C From 3/8 Inch x 0 Run (7-16-71) Crushed To 30 Mesh x 0

Screen Size	Weight Percent	Cumulative
Plus 30 M	6.6	6.6
30 M x 50 M	29.3	35.9
50 M x 100 M	24.5	60.4
Minus 100 M	39.6	100.0

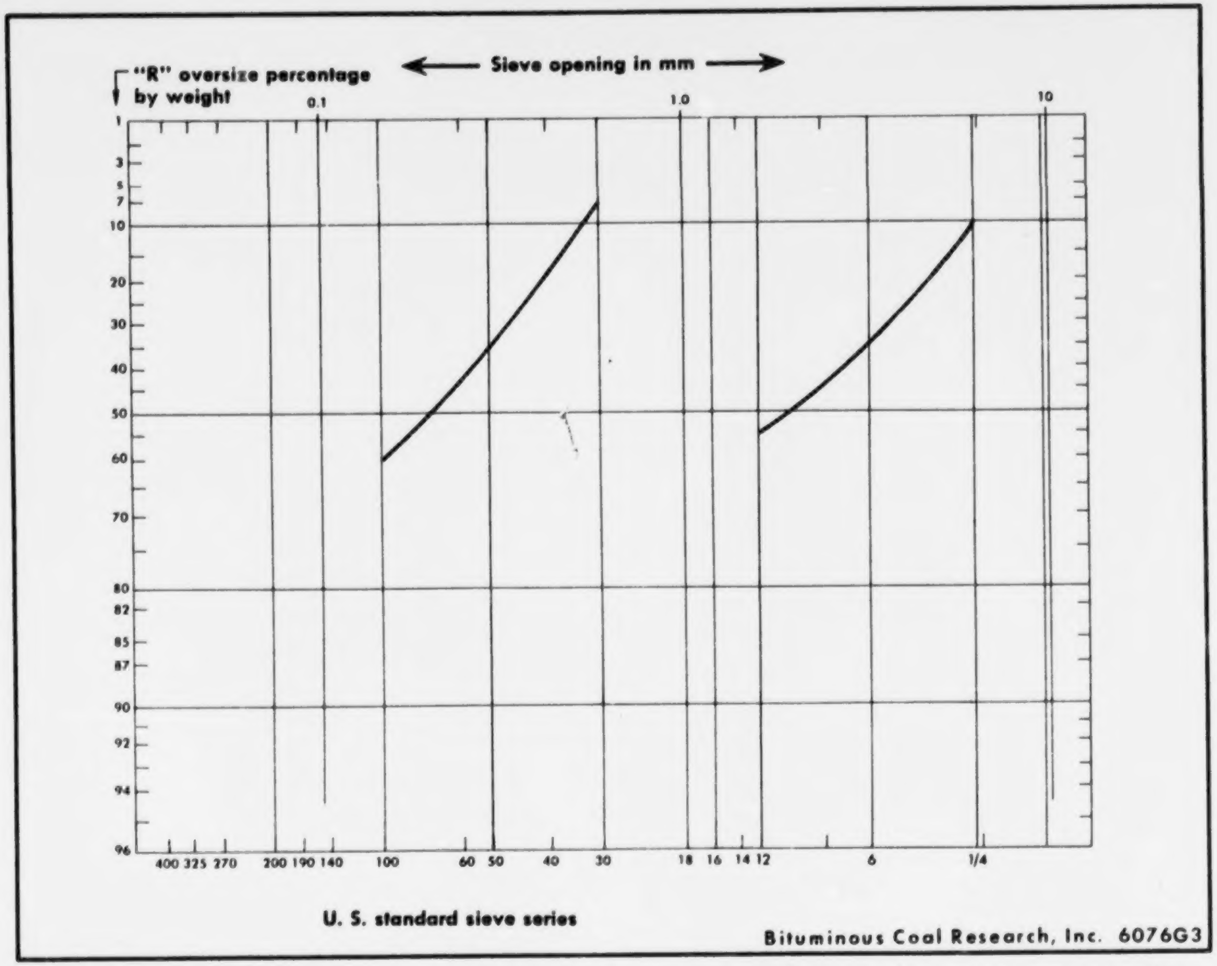

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Figure 3. Size Distribution Curves of 30 Mesh × 0 and 3/8 Inch × 0 Concentrating Table Feeds for Bakerstown Seam, Grant County, West Virginia, BCR Sample No. 2856

TABLE 2. ANALYSES OF ROM COALS SUBJECTED TO DEEP CLEANING STUDIES, DRY BASIS

Coal Identification		Weight Percent							Calorific Value, Btu/lb
Lot	Seam	Ash	Volatile Matter	Fixed Carbon	Total Sulfur	Sulfate Sulfur	Organic Sulfur	Pyritic Sulfur	
2847	W. Ky. No. 6 Seam Butler County, Ky.	10.1	45.7	44.2	5.48	0.02	0.80	4.66	12,772
2856	Bakerstown Seam Grant County, W. Va.	24.0	19.8	56.2	2.88	--	0.46	2.42	11,604
2860	Lower Kittanning Seam Westmoreland County, Pa.	26.4	18.0	55.6	4.18	0.02	0.52	3.64	11,198
2881	Lower Freeport Seam Indiana County, Pa.	19.9	25.0	55.1	1.86	0.02	0.42	1.42	12,294
2889	Ft. Scott Seam Rogers County, Okla.	13.3	41.3	45.4	4.21	0.08	1.17	2.96	12,882
2900	Lower Freeport Seam Butler County, Pa.	15.0	34.2	50.8	3.36	0.04	0.54	2.78	12,576
2926	Baxter Seam Crawford County, Kan.	14.8	38.6	46.6	4.02	0.01	0.78	3.23	12,826
2928	Clements Seam Walker County, Ala.	25.3	31.4	43.3	1.96	--	0.54	1.42	11,044

Feed material for the pyrite beneficiation studies was obtained by collecting all the normal Zone E material, plus a portion of the material that would have ordinarily gone to adjacent Zone D, during a normal 3/8 inch x 0 rough cleaning test.

As illustrated in Figure 2, Zone E collects the pyrite-rich fraction from the coal cleaning test and Zone D, the remaining refuse. The material diverted from Zone D to Zone E is the highest gravity material normally reporting to Zone D and, hence, the material most likely to contain additional pyrite that might be liberated by further size reduction. Eight coals were processed in this manner, and the ash reductions obtained when cleaning these coals at a 3/8 inch x 0 are shown in Table 3.

Table 4 shows the results from a typical 3/8 inch x 0 cleaning test in which a deep cut had been made into the normal Zone D to insure that all the pyrite had been captured for subsequent recleaning. This so-called deep cut is evidenced by a higher than normal percentage of 2.95 float material in Zone E.

The modified Zone E pyrite-rich material from the coal cleaning test was pulverized to a 30 mesh topsize for the initial pyrite beneficiation test with the 15-S metallurgical table, following the flow diagram shown in Figure 1. Table 5 shows a sample copy of the information obtained on the 30 mesh x 0 pyrite cleaning test. The pyrite concentrate from Zone E in this 30 mesh x 0 test, which was very high in total sulfur and low in carbon, was not further processed. For each of the eight coals, the Zone D material from this test was collected, pulverized to minus 60 mesh to further liberate high grade pyrite, and recleaned on the metallurgical table.

Table 6 is a sample copy of the data sheet illustrating the separation obtained from the Bakerstown seam on the metallurgical table when using the 60 mesh x 0 refuse feed material. The breakdown by zones is shown with the secondary pyrite concentrate obtained from Zone E assaying 39.8 percent total sulfur.

Table 7 is a tabulation of the Bakerstown seam pyrite cleaning steps, showing, in the last line of figures, that 1.2 percent of the total feed is recoverable as high grade pyrite containing 43.8 percent sulfur.

The sample flowsheet, Figure 4, shows the steps of pyrite cleaning in a different manner, utilizing a schematic flow diagram and showing the distribution of total sulfur in pounds per ton of R&M coal.

The final sample data sheet, Table 8, shows the chemical data by steps and the total quantity of material removed from each step for subsequent reprocessing.

TABLE 3. ASH REDUCTION OBTAINED FROM DIRECT TWO-STAGE CONCENTRATING TABLE CLEANING

Coal Identification		Percent Ash R.O.M. Feed	Percent Ash, Cleaned 3/8 Inch x 0 Composites*	Percent Primary Reduction	Percent Ash, Cleaned 30 Mesh x 0 Composites*	Percent Secondary Reduction	Percent Total Ash Reduction
Lot	Seam						
2847	Western Ky. No. 6	10.1	6.4	36.6	4.9	23.4	51.5
2856	Bakerstown	24.0	15.6	35.0	12.5	19.9	47.9
2860	Lower Kittanning	26.4	10.9	58.7	7.6	30.3	71.2
2881	Lower Freeport	19.9	14.0	29.6	10.1	27.9	49.2
2889	Ft. Scott	13.3	8.2	38.3	5.4	34.1	59.4
2900	Lower Freeport	15.0	14.0	6.7	11.9	15.0	20.7
2926	Baxter	14.8	12.4	16.2	10.2	17.7	31.1
2928	Clements	25.3	11.2	55.7	7.2	35.7	71.5
Average Reduction (8 coals)				34.6		25.5	50.3

* Cleaned fractions designated represent weight percent composites of Zones A, B, C from the concentrating table runs.

TABLE 4. RESULTS FROM A TYPICAL 3/8 INCH x 0 ROUGH CLEANING AND PYRITE PRECLEANING TEST ON THE NO. 14 CONCENTRATING TABLE - BAKERSTOWN SEAM

			Chemical Analysis, Dry Basis, Weight Percent			
Table Products	Product Weight Percent	Float and Sink Weight Percent	Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	47.3		0.34	10.2	1.23	
Zone B	22.0		0.28	13.0	1.24	
Zone C						
Float at 1.60	6.0	39.7	0.34	15.8	1.35	
1.60 by 1.90	6.6	43.4	0.45	45.2	2.02	
Sink at 1.90	2.6	16.9	0.44	60.5	5.22	
Composite	15.2	100.0		36.1	2.29	
Zone D						
Float at 1.90	2.1	17.3	0.22	36.2	1.86	
1.90 by 2.95	8.6	71.2	0.36	77.8	4.89	
Sink at 2.95	1.4	11.5	0.20	61.0	38.6	
Composite	12.1	100.0		68.4	8.24	
Zone E						
Float at 2.95	1.3	39.1	0.80	79.2	6.34	
Sink at 2.95	2.1	60.9	0.22	62.0	40.5	
Composite	3.4	100.0		68.7	27.1	
Composite of Zones A, B, C	84.5			15.6	1.42	
Composite of 1.60 Float Fractions	75.3			11.5	1.24	
Composite of 2.95 Sink Fractions	3.5			61.6	39.7	
Composite of Table Products	100.0			23.8	3.12	
Analysis of Feed to Table			0.66	24.0	2.88	

Run Date: 7-16-71

TABLE 5. RESULTS FROM A TYPICAL 30 MESH x 0 PYRITE CLEANING TEST ON THE NO. 15-S CONCENTRATING TABLE - BAKERSTOWN SEAM

Table Products	Product Weight Percent	Float and Sink Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
			Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	81.8		0.61	12.0	1.09	
Zone B	10.0		0.47	15.1	1.12	
Zone C						
Float at 1.60	0.7	71.3	0.47	18.9	1.14	
Sink at 1.60	0.3	28.7	0.42	43.8	2.94	
Composite	1.0	100.0		26.0	1.66	
Zone D						
Float at 1.60	0.6	9.4	0.62	27.3	1.16	
1.60 by 2.95	5.8	87.4	0.68	55.2	2.20	
Sink at 2.95	0.2	3.2	0.18	61.0	43.1	
Composite	6.6	100.0		52.8	3.41	
Zone E						
Float at 2.95	0.1	17.8	0.69	68.2	13.0	
Sink at 2.95	0.5	82.2	0.22	62.1	44.1	
Composite	0.6	100.0		63.2	38.6	
Composite of Zones A, B, C	92.8			12.5	1.10	
Composite of 1.60 Float Fractions	93.1			12.5	1.09	
Composite of 2.95 Sink Fractions	0.7			61.8	43.8	
Composite of Table Products	100.0			15.5	1.48	
Analysis of Feed to Table			0.50	16.4	1.65	

Run Date: 7-27-71

TABLE 6. RESULTS FROM A TYPICAL 60 MESH x 0 PYRITE CLEANING TEST ON THE NO. 15-S CONCENTRATING TABLE - BAKERSTOWN SEAM

Table Products	Product, Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
		Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	24.0	0.43	74.4	20.4	
Zone B	35.4	0.64	75.3	19.4	
Zone C	13.8	0.38	76.0	15.8	
Zone D	14.0	0.68	78.2	17.4	
Zone E	12.8	0.26	69.3	39.8	
Composite of Table Products	100.0		74.8	21.5	
Analysis of Feed to Table		0.34	75.1	21.2	

Run Date: 7-29-71

TABLE 7. COMPILATION OF RESULTS FROM A TYPICAL PYRITE BENEFICIATION TEST - BAKERSTOWN SEAM

Pyrite Precleaning

Concentrating Table No. 14 Test Run Date 7-16-71
Feed to Concentrating Table: Raw Run-of-mine Coal Crushed To 3/8 Inch x 0

	Product, Weight %	Chemical Analysis, Dry Basis, Weight %	
		Ash	Total Sulfur
Analysis of Feed to Table		24.0	2.88
Zone E (Pyrite Zone)	3.4	68.7	27.1

Pyrite Cleaning

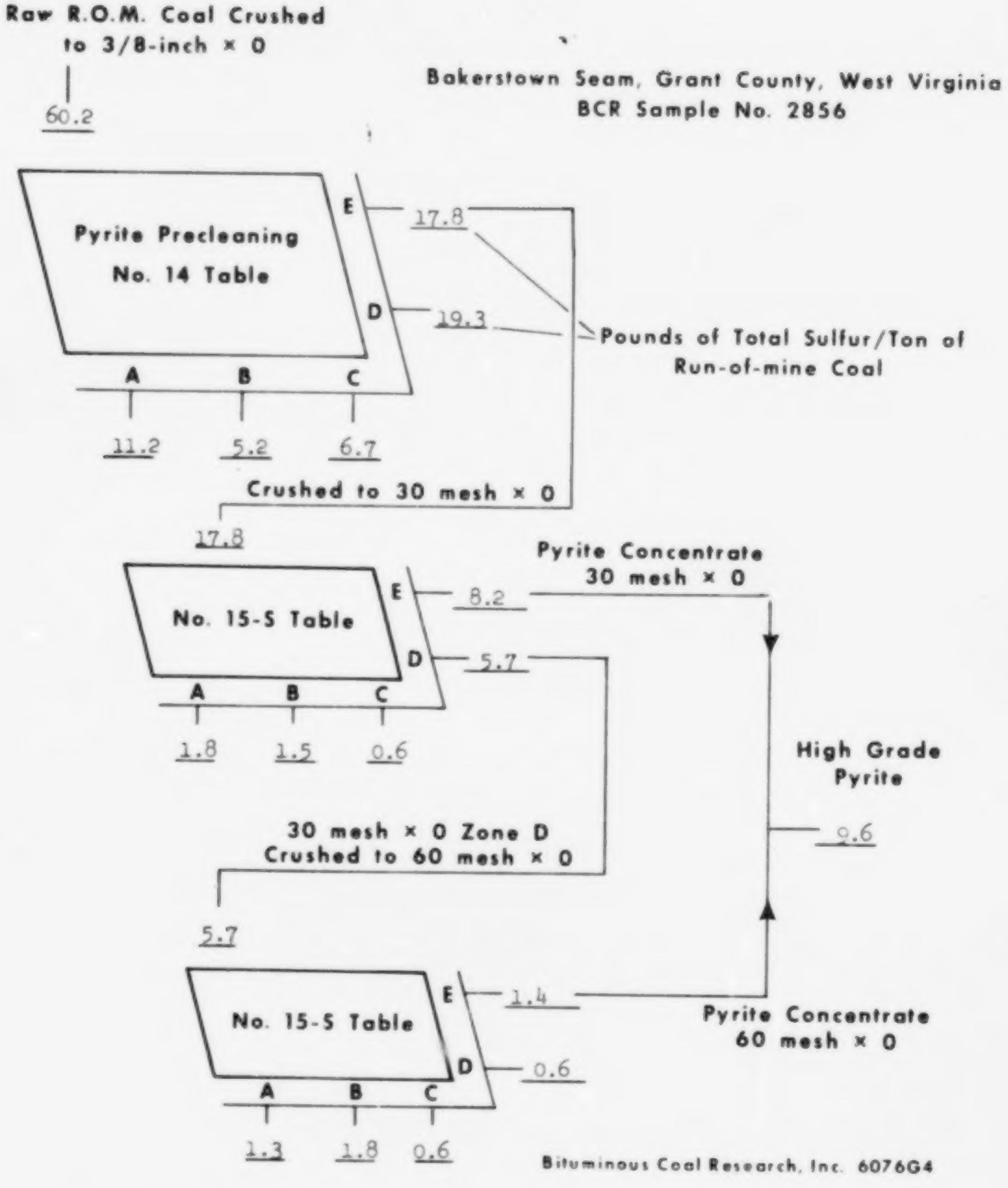
Concentrating Table No. 15-S Test Run Date 7-28-71
Feed to Concentrating Table: Zone E, 3/8 Inch x 0 Run (7-16-71) Crushed To 30 Mesh x 0

	Product, Weight %	Chemical Analysis, Dry Basis, Weight %	
		Ash	Total Sulfur
Analysis of Feed to Table		68.7	27.1
Zone E (Pyrite Zone)	28.2	64.5	44.6

Concentrating Table No. 15-S Test Run Date 7-29-71
Feed to Concentrating Table: Zone D, 30 Mesh x 0 Run (7-28-71) Crushed To 60 Mesh x 0

	Product, Weight %	Chemical Analysis, Dry Basis, Weight %	
		Ash	Total Sulfur
Analysis of Feed to Table		75.1	21.2
Zone E (Pyrite Zone)	12.8	69.3	39.8

Two Stage Pyrite Product	1.2	65.3	43.8


Raw R.O.M. Coal Crushed
to 3/8-inch × 0
60.2
Bakerstown Seam, Grant County, West Virginia
BCR Sample No. 2856
Pyrite Precleaning
No. 14 Table
E
17.8
D
19.3
Pounds of Total Sulfur/Ton of
Run-of-mine Coal
A
B
C
11.2
5.2
6.7
Crushed to 30 mesh × 0
17.8
No. 15-S Table
E
8.2
Pyrite Concentrate
30 mesh × 0
D
5.7
A
B
C
1.8
1.5
0.6
High Grade
Pyrite
9.6
30 mesh × 0 Zone D
Crushed to 60 mesh × 0
5.7
No. 15-S Table
E
1.4
Pyrite Concentrate
60 mesh × 0
D
0.6
A
B
C
1.3
1.8
0.6

Bituminous Coal Research, Inc. 6076G4

Figure 4. Sample Flowsheet for Pyrite Beneficiation Tests

TABLE 8. SAMPLE FLOWSHEET FOR PYRITE BENEFICIATION TEST - BAKERSTOWN SEAM

Fraction	Weight Percent		Chemical Analysis, Dry Basis Weight Percent	
			Ash	Total Sulfur
Table No. 14				
Zone A	47.3		10.2	1.23
Zone B	22.0		13.0	1.24
Zone C	15.2		36.1	2.29
Zone D	12.1		68.4	8.24
Zone E		3.4	68.7	27.1
Table No. 15-S (30 Mesh x 0)				
Zone A	0.4		60.3	24.4
Zone B	0.3		60.8	22.7
Zone C	0.1		59.9	22.0
Zone D		1.6	76.8	18.6
Zone E	1.0		64.5	44.6
Table No. 15-S (60 Mesh x 0)				
Zone A	0.4		74.4	20.4
Zone B	0.6		75.3	19.4
Zone C	0.2		76.0	15.8
Zone D	0.2		78.2	17.4
Zone E	0.2		69.3	39.8
Composite of Fractions	100.0		23.8	3.18
Analysis of Feed Coal			24.0	2.88

Complete analytical data for each Phase II coal, as exemplified by the foregoing tables, are compiled as Appendix A, Tables A1 through A79.

B. Summary

1. Coal Cleaning: The samples selected for Phase II research represent a cross section of the high-sulfur bituminous steam coals in the United States. Coals from as far west as Kansas and Oklahoma and as far south as Alabama were included with northern Appalachian coals in these tests. As shown in Table 9 and illustrated graphically in Figure 5, this sequence of coals generally resisted beneficiation relative to pyrite removal despite optimistic projections from earlier Phase I studies. Typical of this discrepancy is the Western Kentucky No. 6 seam (BCR 2847) from Butler County, Kentucky. Phase I data reported in Table 2 of BCR Final Report L-404 (April 1971) showed a 75.0 percent reduction in total sulfur content at a 30 mesh x 0 size consist; but two-stage beneficiation, as shown by Table 9, produced only 30.8 percent reduction in total sulfur from a somewhat greater raw coal concentration.

Another example involved the Lower Freeport coal, widely used for steam generation around Butler County, Pennsylvania. Phase I research showed 58.2 percent expected sulfur decrease, but two-stage beneficiation of the same coal produced only 36.6 percent reduction despite a much higher raw coal sulfur value (3.36 percent versus 2.20 percent from Phase I, Lot 2447).

The average primary (single stage) sulfur reduction for this suite of eight coals was 23.1 percent, while the two-stage separation averaged 33.3 percent. Most difficult to beneficiate were the southern and western coals. As shown in Table 9, the Clements seam (BCR 2928) from Walker County, Alabama and the Ft. Scott seam (BCR 2889) from Rogers County, Oklahoma, produced only 11.7 percent and 14.7 percent overall sulfur reduction, respectively. These coals, however, showed the highest relative percentage (of the 8 coals tested) of their total sulfur content as organic sulfur, which is essentially not removable.

The Bakerstown coal (BCR 2856) from Grant County, West Virginia and the Lower Kittanning coal (BCR 2860) from Westmoreland County, Pennsylvania, responded most favorably to wet table beneficiation. Reductions in total sulfur content of 61.8 percent and 54.5 percent, respectively, were realized from the two-stage washing; however, the sulfur in these coals was most dominantly pyritic in origin.

A more detailed definition of the effects of "direct" Deister table cleaning in specific zones is shown in Table 10. Any mention of "direct" cleaning in the text refers to all material reporting to Zones A, B, and C, without considering misplaced higher gravity refuse contaminants.

TABLE 9. TOTAL SULFUR REDUCTION OBTAINED FROM DIRECT TWO-STAGE CONCENTRATING TABLE CLEANING

Coal Identification		Percent Total Sulfur R.O.M. Feed	Percent Total Sulfur Clean 3/8 Inch x 0 Composites*	Percent Primary Reduction	Percent Total Sulfur Clean 30 Mesh x 0 Composites*	Percent Secondary Reduction	Percent Overall Sulfur Reduction
Lot	Seam						
2847	Western Ky. No. 6	5.48	3.89	29.0	3.79	2.6	30.8
2856	Bakerstown	2.88	1.42	50.7	1.10	22.5	61.8
2860	Lower Kittanning	4.18	2.44	41.6	1.90	22.1	54.5
2881	Lower Freeport	1.86	1.44	22.6	1.22	15.3	34.4
2889	Ft. Scott	4.21	3.74	11.2	3.59	4.0	14.7
2900	Lower Freeport	3.36	2.83	15.8	2.13	24.7	36.6
2926	Baxter	4.02	3.62	10.0	3.15	13.0	21.6
2928	Clements	1.96	1.88	4.1	1.73	8.0	11.7
	Average Reduction (8 coals)			23.1		14.0	33.3

* Cleaned Fractions Designated Represent Direct Weight Percent Composites of Zones A, B, C from the No. 14 Concentrating Table Runs.

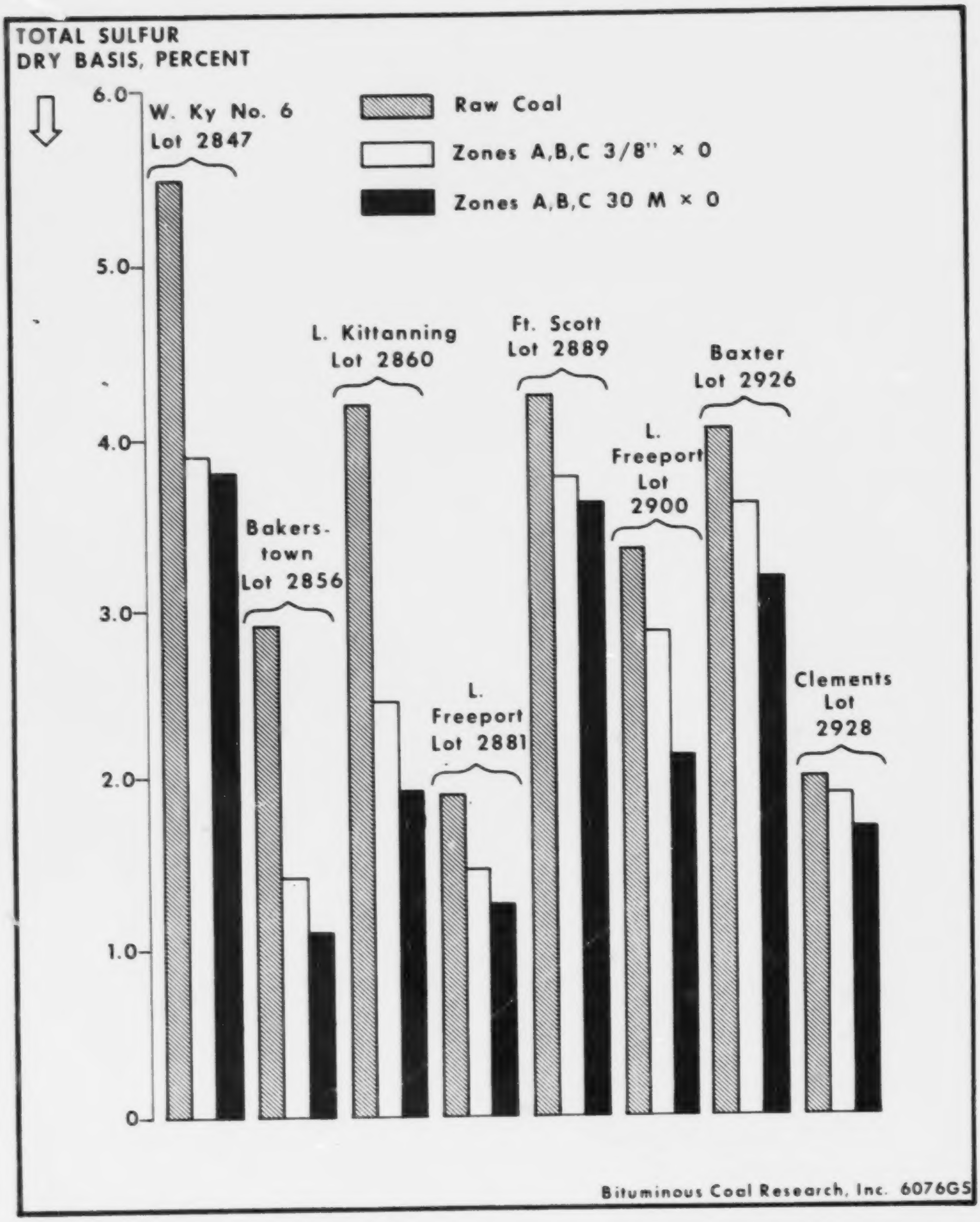


Figure 5. Total Sulfur Reduction from Direct Two-stage Cleaning

TABLE 10. EFFECTS OF NO. 14 TABLE CLEANING ON PHASE II SEAM COALS

	Kentucky No. 6 BCR 2847		Bakerstown BCR 2856		Lower Kittanning BCR 2860		Lower Freeport BCR 2881	
	Weight percent	Percent Benefi-ciation	Weight percent	Percent Benefi-ciation	Weight percent	Percent Benefi-ciation	Weight percent	Percent Benefi-ciation
Feed Coal (Composite):								
Recovery	100.00		100.00		100.00		100.00	
Ash	8.63		23.80		29.50		23.60	
Total Sulfur	5.10		3.12		4.44		2.03	
3/8" x 0 Rough Cleaning:								
Zone A - Recovery	26.90	--	47.30	--	45.90	--	46.60	--
Ash	5.98	30.7	10.20	57.1	8.26	72.0	8.21	65.2
Total Sulfur	3.47	32.0	1.23	60.6	1.90	57.2	1.28	36.9
Zone B - Recovery	43.20	--	22.00	--	17.50	--	18.20	--
Ash	4.88	43.5	13.00	45.4	8.10	72.5	8.35	64.6
Total Sulfur	3.53	30.8	1.24	60.3	2.09	52.9	1.36	33.0
Zone C - Recovery	25.90	--	15.20	--	8.40	--	19.70	--
Ash	9.50	--	36.10	--	31.40	--	33.10	--
Total Sulfur	4.93	3.3	2.29	26.6	6.12	--	1.90	6.4
Zone D - Recovery	1.80	--	12.10	--	12.10	--	10.90	--
Ash	59.10	--	68.40	--	76.10	--	74.70	--
Total Sulfur	28.90	--	8.24	--	5.47	--	3.61	--
Zone E - Recovery	2.20	--	3.40	--	16.10	--	4.60	--
Ash	63.20	--	68.70	--	77.30	--	79.00	--
Total Sulfur	38.40	--	27.10	--	12.60	--	9.09	--
Single Stage Washed Composite:*								
Recovery	96.00	--	84.50	--	71.80	--	84.50	--
Ash	6.44	25.4	15.60	34.5	10.90	63.1	14.00	40.7
Total Sulfur	3.89	23.7	1.42	54.5	2.44	45.0	1.44	29.1
30M x 0 Deep Cleaning:								
Zone A - Recovery	83.20	--	81.80	--	83.30	--	80.20	--
Ash	4.82	44.1	12.00	49.6	7.46	74.7	10.20	56.8
Total Sulfur	3.74	26.7	1.09	65.1	1.88	57.7	1.24	38.9
Zone B - Recovery	13.70	--	10.00	--	10.70	--	13.10	--
Ash	4.84	43.9	15.10	36.6	8.06	72.7	9.50	59.7
Total Sulfur	3.92	23.1	1.12	64.1	1.98	55.4	1.08	46.8
Zone C - Recovery	1.20	--	1.00	--	1.00	--	0.60	--
Ash	8.98	--	26.00	--	15.50	47.5	12.30	47.9
Total Sulfur	5.65	--	1.66	46.8	2.92	34.2	1.46	28.1
Zone D - Recovery	1.40	--	6.60	--	4.60	--	5.70	--
Ash	30.30	--	52.80	--	50.40	--	51.50	--
Total Sulfur	13.20	--	3.41	--	7.76	--	1.76	13.3
Zone E - Recovery	0.50	--	0.60	--	0.40	--	0.40	--
Ash	59.00	--	63.20	--	64.70	--	70.80	--
Total Sulfur	30.00	--	38.60	--	34.60	--	24.00	--
Two Stage Washed Composite:*								
Recovery	94.20	--	78.40	--	68.20	--	79.40	--
Ash	4.87	43.6	12.50	47.5	7.61	74.2	10.10	57.2
Total Sulfur	3.79	25.7	1.10	64.7	1.90	57.2	1.22	39.9

* Weight Percent Composite of Zones A, B,

ON PHASE II SEAM COALS (Computed from Table Composites)

Lower Freeport BCR 2881		Fort Scott BCR 2889		Lower Freeport BCR 2900		Baxter BCR 2926		Clements BCR 2928	
Weight percent	Percent Beneficiation	Weight percent	Percent Beneficiation	Weight percent	Percent Beneficiation	Weight percent	Percent Beneficiation	Weight percent	Percent Beneficiation
100.00		100.00		100.00		100.00		100.00	
23.60		12.40		15.20		14.00		24.10	
2.03		4.16		3.44		4.10		2.01	
46.60	--	43.00	--	43.90	--	27.20	--	31.50	--
8.21	65.2	6.51	47.5	11.70	23.0	10.50	25.0	9.99	58.5
1.28	36.9	3.44	17.3	2.20	36.0	2.92	28.8	1.40	30.3
18.20	--	39.20	--	42.30	--	46.00	--	34.00	--
8.35	64.6	5.12	58.7	11.80	22.4	9.66	31.0	8.02	66.7
1.36	33.0	3.58	13.9	2.22	35.5	3.06	25.4	1.88	6.5
19.70	--	10.80	--	11.10	--	23.50	--	16.20	--
33.10	--	26.40	--	31.70	--	20.00	--	22.20	--
1.90	6.4	5.49	--	7.67	--	5.53	--	2.83	--
10.90	--	4.80	--	2.10	--	2.30	--	14.80	--
74.70	--	66.60	--	57.80	--	59.00	--	79.10	--
3.61	--	7.17	--	22.10	--	16.50	--	1.97	2.0
4.60	--	2.20	--	0.60	--	1.00	--	3.50	--
79.00	--	69.30	--	60.90	--	67.80	--	83.30	--
9.09	--	15.30	--	36.00	--	21.90	--	5.07	--
84.50	--	93.00	--	97.30	--	96.70	--	81.70	--
14.00	40.7	8.23	33.6	14.00	7.9	12.40	11.4	11.60	51.9
1.44	29.1	3.74	10.1	2.83	17.7	3.62	11.7	1.88	6.5
80.20	--	81.10	--	78.10	--	81.40	--	82.40	--
10.20	56.8	5.38	56.6	11.40	25.0	9.99	28.6	6.92	71.3
1.24	38.9	3.56	14.4	2.14	37.8	3.10	24.4	1.66	17.4
13.10	--	13.80	--	13.80	--	13.90	--	12.80	--
9.50	59.7	5.08	59.0	13.40	11.8	10.40	25.7	7.88	67.3
1.08	46.8	3.70	11.1	1.92	44.2	3.08	24.9	1.98	1.5
0.60	--	0.50	--	1.80	--	2.40	--	1.10	--
12.30	47.9	9.55	23.0	20.90	--	17.60	--	17.40	27.8
1.46	28.1	4.90	--	3.09	10.2	5.31	--	3.89	--
5.70	--	4.50	--	5.70	--	2.10	--	3.20	--
51.50	--	53.80	--	39.30	--	50.50	--	36.60	--
1.76	13.3	7.87	--	8.91	--	13.50	--	5.29	--
0.40	--	0.10	--	0.60	--	0.20	--	0.50	--
70.80	--	69.50	--	62.90	--	66.60	--	66.70	--
24.00	--	16.60	--	40.80	--	24.80	--	11.60	--
79.40	--	88.70	--	91.20	--	94.50	--	78.70	--
10.10	57.2	5.36	56.8	11.90	21.7	10.20	27.1	7.17	70.2
1.22	39.9	3.59	13.7	2.13	38.1	3.15	23.2	1.73	13.9

Composite of Zones A, B, and C

TABLE 11. POTENTIAL COMBUSTION USE OF SELECTED FRACTION FROM BAKERSTOWN COAL USING "CONVENTIONAL" THREE-SPLIT SEPARATION OF 3/8 INCH x 0 COAL

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value	% of Total Usable Product
		Ash	Total Sulfur	Calorific Value Btu/lb		
Zone A (assumed 1.60 Fl.)	47.3	10.2	1.23	14,014		
Zone B (assumed 1.60 Fl.)	22.0	13.0	1.24	13,490		
Zone C, 1.60 Fl.	6.0	15.8	1.35	12,921		
Composite of Fractions	75.3	11.5	1.24	13,774	89.5	83.6
High Sulfur Combustor Feedstock						
Zone C, 1.60 x 1.90	6.6	45.2	2.02	7,891		
Zone C, 1.90 Sk.	2.6	60.5	5.22	5,144		
Zone D, 1.90 Fl.	2.1	36.2	1.86	9,426		
Zone D, 2.95 Sk.	1.4	61.0	38.60	3,870		
Zone E, 2.95 Sk.	2.1	62.0	40.50	3,565		
Composite of Fractions	14.8	50.5	11.48	6,632	8.5	16.4
Refuse						
Zone D, 1.90 x 2.95	8.6	77.8	4.89	2,354		
Zone E, 2.95 Fl.	1.3	79.2	6.34	2,067		
Composite of Fractions	9.9	78.0	5.08	2,316	2.0	-
Composite of Table Fractions	100.0	23.8	3.14	11,583		

Most coals realized the greater quantity of sulfur removal in the 3/8 inch x 0 rough separation but, as shown graphically in Figure 5, the Lower Freeport seam (BCR 2900) from Butler County, Pennsylvania, produced a greater reduction during secondary deep-cleaning. Apparently the finer grinding (30 mesh topsize) is most critical for sulfur removal from this coal.

2. Coal Utilization Potential: Employing the total seam utilization concept inititated in Final Report L-404 (April 1971), 3/8 inch x 0 coal analytical data were compiled relative to arbitrary two-split and three-split gravity fractions. For comparison, the "direct" two-split separation was included. As shown in sample data sheets from the Bakerstown seam, presented as Tables 11 and 12, three-split separations were made to obtain three distinct products: a low sulfur combustor feedstock, a high sulfur combustor feedstock, and a refuse product.

The low sulfur combustor feedstock ideally should contain a sulfur content below 1.0 percent in conjunction with a high calorific content. The high sulfur combustor feedstock may have a higher sulfur content and lower calorific value while the third product should contain the high ash, low calorific value refuse material. As shown in Table 11, a "conventional" three-split separation of the Bakerstown seam concentrates 89.5 percent of the total calorific value available in the coal in the low-sulfur combustor feedstock with a 1.24 percent total sulfur content. In Table 12 the gravity separations were composited in the "unconventional" manner initiated in BCR L-404. This composite includes the 1.60 float fraction from Zone C with the high-sulfur combustor feedstock which insignificantly altered the ash, sulfur, and calorific value of the low-sulfur coal but greatly increased the available Btu in the high-sulfur combustor feedstock.

Composites of the "conventional" and "unconventional" three-split combinations of each of the Phase II coals are presented in Table 13. As expected, the "unconventional" gravity separate combinations consistently produced better quality high-sulfur feedstock but did not essentially change the low sulfur product.

When a low-sulfur combustor product alone is required, a two-split separation would be utilized. Tables 14 and 15 illustrate both "direct" and "conventional" two-split methods for compositing the Bakerstown seam coal. As previously described, the "direct" composite incorporates all material reporting to Zones A, B, and C as clean coal, while combining Zones D and E as refuse.

The "conventional" two-split separation produced a cleaner low-sulfur product by including Zone C 1.60 sink fractions in the refuse product. This "conventional" composite effected a 4 percent decrease in ash and a 0.2 percent decrease in total sulfur in the Bakerstown coal but recovered less of the total coal.

TABLE 11. POTENTIAL COMBUSTION USE OF SELECTED FRACTION FROM BAKERSTOWN COAL USING "CONVENTIONAL" THREE-SPLIT SEPARATION OF 3/8 INCH x 0 COAL

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value	% of Total Usable Product
		Ash	Total Sulfur	Calorific Value Btu/lb		
Zone A (assumed 1.60 Fl.)	47.3	10.2	1.23	14,014		
Zone B (assumed 1.60 Fl.)	22.0	13.0	1.24	13,490		
Zone C, 1.60 Fl.	6.0	15.8	1.35	12,921		
Composite of Fractions	75.3	11.5	1.24	13,774	89.5	83.6
High Sulfur Combustor Feedstock						
Zone C, 1.60 x 1.90	6.6	45.2	2.02	7,891		
Zone C, 1.90 Sk.	2.6	60.5	5.22	5,144		
Zone D, 1.90 Fl.	2.1	36.2	1.86	9,426		
Zone D, 2.95 Sk.	1.4	61.0	38.60	3,870		
Zone E, 2.95 Sk.	2.1	62.0	40.50	3,565		
Composite of Fractions	14.8	50.5	11.48	6,632	8.5	16.4
Refuse						
Zone D, 1.90 x 2.95	8.6	77.8	4.89	2,354		
Zone E, 2.95 Fl.	1.3	79.2	6.34	2,067		
Composite of Fractions	9.9	78.0	5.08	2,316	2.0	-
Composite of Table Fractions	100.0	23.8	3.14	11,583		

TABLE 12. POTENTIAL COMBUSTION USE OF SELECTED FRACTION FROM BAKERSTOWN COAL USING "UNCONVENTIONAL" THREE-SPLIT SEPARATION OF 3/8 INCH x 0 COAL

	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value	% of Total Usable Product
		Ash	Total Sulfur	Calorific Value Btu/lb		
Low Sulfur Combustor Feedstock						
Zone A (assumed 1.60 Fl.)	47.3	10.2	1.23	14,014		
Zone B (assumed 1.60 Fl.)	22.0	13.0	1.24	13,490		
Composite of Fractions	69.3	11.1	1.23	13,848	82.8[+]	76.9
High Sulfur Combustor Feedstock						
Zone C, 1.60 Fl.	6.0	15.8	1.35	12,921		
Zone C, 1.60 x 1.90	6.6	45.2	2.02	7,891		
Zone C, 1.90 Sk.	2.6	60.5	5.22	5,144		
Zone D, 1.90 Fl.	2.1	36.2	1.86	9,426		
Zone D, 2.95 Sk.	1.4	61.0	38.60	3,870		
Zone E, 2.95 Sk.	2.1	62.0	40.50	3,565		
Composite of Fractions	20.8	40.5	8.56	8,446	15.2	23.1
Refuse						
Zone D, 1.90 x 2.95	8.6	77.8	4.89	2,354		
Zone E, 2.95 Fl.	1.3	79.2	6.34	2,067		
Composite of Fractions	9.9	78.0	5.08	2,316	2.0	-
Composite of Table Fractions	100.0	23.8	3.14	11,583		

TABLE 13. POTENTIAL THREE-SPLIT COMBINATIONS FOR MAXIMUM UTILIZATION OF 3/8 I

	W. Ky. No. 6 BCR No. 2847			Bakerstown BCR No. 2856			L. Kittanning BCR No. 2860			L. Freeport BCR No. 2881			
	L.S.	H.S.	R.	L.S.	H.S.	R.	L.S.	H.S.	R.	L.S.	H.S.	R.	L.
										Conventional Three-Split			
Percent:													
Yield	93.8	5.0	1.2	75.3	14.8	9.9	67.5	8.8	23.7	74.6	12.3	13.1	8
Ash	5.36	56.38	64.95	11.5	50.5	78.0	8.38	55.93	79.84	8.58	53.69	81.08	6.
Total Sulfur	3.63	29.96	15.18	1.24	11.48	5.08	2.02	21.19	5.13	1.32	5.35	2.77	3.
Calorific Content (Btu)	13,792	4,450	4,085	13,774	6,632	2,316	14,383	5,309	1,800	14,177	6,448	1,916	14,
Percent:													
Available Btu	97.9	1.7	0.4	89.5	8.5	2.0	91.6	4.4	4.0	91.0	6.8	2.2	9
Total Coal	94.9	5.1	-	83.6	16.4	-	88.5	11.5	-	85.8	14.2	-	9
										Unconventional Three-Split			
Percent:													
Yield	70.1	28.7	1.2	69.3	20.8	9.9	63.4	12.9	23.7	64.8	22.1	13.1	8
Ash	5.30	14.38	64.95	11.1	40.5	78.0	8.22	41.65	79.85	8.25	34.67	81.08	5.
Total Sulfur	3.51	8.51	15.18	1.23	8.56	5.08	1.95	15.41	5.13	1.30	3.62	2.77	3.
Calorific Content (Btu)	13,815	12,109	4,085	13,848	8,446	2,316	14,423	8,000	1,800	14,231	9,719	1,916	14,
Percent:													
Available Btu	73.3	26.3	0.4	82.8	15.2	2.0	86.3	9.7	4.0	79.3	18.5	2.2	8
Total Coal	71.0	29.0	-	76.9	23.1	-	83.1	16.9	-	74.6	25.4	-	8

Legend

L.S. - Low Sulfur Combustor Feedstock
H.S. - High Sulfur Combustor Feedstoc
R. - Refuse

UTILIZATION OF 3/8 INCH x 0 PHASE II COALS FOR COMBUSTION FEEDSTOCK

L. Freeport BCR No. 2881			Ft. Scott BCR No. 2889			L. Freeport BCR No. 2900			Baxter BCR No. 2926			Clements BCR No. 2928		
S.	H.S.	R.	L.S.	H.S.	R.	L.S.	H.S.	R.	L.S.	H.S.	R.	L.S.	H.S.	R.
ventional Three-Split														
74.6	12.3	13.1	89.2	5.7	5.1	92.0	6.8	1.2	92.1	6.2	1.7	78.2	5.1	16.7
8.58	53.69	81.08	6.08	57.60	71.79	12.00	50.11	63.91	10.18	55.80	68.18	9.36	54.61	83.61
1.32	5.35	2.77	3.65	12.01	4.49	2.27	17.39	14.38	3.15	17.40	6.58	1.84	6.05	1.57
,177	6,448	1,916	14,004	4,818	1,461	13,038	6,152	4,102	13,589	4,699	1,244	13,738	5,980	1,114
91.0	6.8	2.2	97.3	2.1	0.6	96.2	3.4	0.4	97.6	2.3	0.2	95.6	2.7	1.7
85.8	14.2	-	94.0	6.0	-	93.1	6.9	-	93.7	6.3	-	93.9	6.1	-
ventional Three-Split														
64.8	22.1	13.1	82.2	12.7	5.1	86.2	12.6	1.2	73.2	25.1	1.7	65.5	17.8	16.7
8.25	34.67	81.08	5.85	30.73	71.79	11.75	34.31	63.91	9.97	22.06	68.18	8.97	23.78	83.61
1.30	3.62	2.77	3.51	8.31	4.49	2.21	10.84	14.38	3.01	7.09	6.58	1.65	3.74	1.57
,231	9,719	1,916	14,049	9,593	1,461	13,082	9,018	4,102	13,635	11,258	1,244	13,808	11,257	1,114
79.3	18.5	2.2	89.9	9.5	0.6	90.5	9.1	0.4	77.8	22.0	0.2	80.5	17.8	1.7
74.6	25.4	-	86.6	13.4	-	87.2	12.8	-	74.5	25.5	-	78.6	21.4	-

Legend

Sulfur Combustor Feedstock
h Sulfur Combustor Feedstock
use

TABLE 14. POTENTIAL COMBUSTION USE OF SELECTED FRACTIONS FROM BAKERSTOWN COAL USING "DIRECT" TWO-SPLIT SEPARATION

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value
		Ash	Total Sulfur	Calorific Value Btu/lb	
Zone A (assumed 1.60 Fl.)	47.3	10.2	1.23	14,014	
Zone B (assumed 1.60 Fl.)	22.0	13.0	1.24	13,490	
Zone C, 1.60 Fl.	6.0	15.8	1.35	12,921	
Zone C, 1.60 x 1.90	6.6	45.2	2.02	7,891	
Zone C, 1.90 Sk.	2.6	60.5	5.22	5,144	
Composite of Fractions	84.5	15.6	1.42	13,052	95.[illegible]
Refuse					
Zone D, 1.90 Fl.	2.1	36.2	1.86	9,426	
Zone D, 1.90 x 2.95	3.6	77.8	4.89	2,354	
Zone D, 2.95 Sk.	1.4	61.0	30.60	3,870	
Zone E, 2.95 Fl.	1.3	79.2	6.34	2,067	
Zone E, 2.95 Sk.	2.1	62.0	40.50	3,565	
Composite of Fractions	15.5	68.5	12.38	3,582	4.8
Composite of Table Fractions	100.0	23.8	3.12	11,584	

TABLE 15. POTENTIAL COMBUSTION USE OF SELECTED FRACTIONS FROM BAKERSTOWN COAL USING "CONVENTIONAL" TWO-SPLIT SEPARATION

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value
		Ash	Total Sulfur	Calorific Value Btu/lb	
Zone A (assumed 1.60 Fl.)	47.3	10.2	1.23	14,014	
Zone B (assumed 1.60 Fl.)	22.0	13.0	1.24	13,490	
Zone C, 1.60 Fl.	6.0	15.8	1.35	12,921	
Composite of Fractions	75.3	11.5	1.24	13,774	89.5
Refuse					
Zone C, 1.60 x 1.90	6.6	45.2	2.02	7,891	
Zone C, 1.90 Sk.	2.6	60.5	5.22	5,144	
Zone D, 1.90 Fl.	2.1	36.2	1.86	9,426	
Zone D, 1.90 x 2.95	8.6	77.8	4.89	2,354	
Zone D, 2.95 Sk.	1.4	61.0	38.60	3,870	
Zone E, 2.95 Fl.	1.3	79.2	6.34	2,067	
Zone E, 2.95 Sk.	2.1	62.0	40.50	3,565	
Composite of Fractions	24.7	61.5	8.91	4,902	10.5
Composite of Table Fractions	100.0	23.8†	3.12	11,584	

The two-split composites of all Phase II coals are presented in Table 16. While quality of low sulfur combustor products was somewhat improved in the "conventional" composites, none of these eight coals could be cleaned below the 1.0 percent total sulfur level using the concentrating table.

Table 10 shows high percentages of beneficiation relative to raw coal sulfur content but, even in the Zone A deep cleaned separations, sulfur content for these coals did not fall below the 1.0 percent standard.

It should be mentioned that the combination of the various gravity separation fractions is by no means a standard method. Instead, it is merely meant to be a very general guideline. In most cases, the optimum combination of these fractions will vary from coal to coal, depending on whether quantity or quality of feed material for the combustor is stressed. Also, the terms "conventional," "unconventional," and "direct" are used merely to distinguish between possible methods of combining the fractions.

The complete sulfur combustor data for the eight Phase II coals are shown in Appendix B, Tables B1 through B32.

3. Power Generation Potential: This evaluation of Phase II coals deals with their potential for power generation. Toward this end, ash fusion and ash composition analyses were completed on the 3/8 inch x 0 feed coal as well as the gravity-separated zone samples.

Most of the high capacity furnaces in use today are the so-called dry bottom type. These furnaces are designed to permit ash to cool and solidify before it comes into contact with boiler surfaces. Therefore, coals with relatively high ash fusion temperatures are preferred. Ash fusion temperatures, and particularly the "softening temperature," reflect, to some degree, the refractory properties of the ash.

Higher softening temperatures generally indicate higher relative percentages of silica and aluminum oxides, particularly when concentrations of fluxing iron and calcium and magnesium oxides are low.

From ash composition analyses, an estimate of the raw coal potential and that of the washed composite may be derived. Additional information relative to slagging in the radiation section, or fouling in the convection pass of a boiler may be estimated, using calculated indices developed from ash composition analyses. These indices, designated as the R_s (slagging index) and R_f (fouling index) respectively, represent the product of the base/acid ratio with the sulfur and with the sodium content in the coal ash.

TABLE 16. POTENTIAL TWO-SPLIT COMBINATIONS FOR MAXIMUM UTILIZAT

	W. Ky. No. 6 BCR No. 2847			Bakerstown BCR No. 2856			L. Kittanning BCR No. 2860			L. Freep BCR No.	
	Raw	**Clean**	**Refuse**	**Raw**	**Clean**	**Refuse**	**Raw**	**Clean**	**Refuse**	**Raw**	**Clean**
										Direct Two	
Percent:											
Yield	100.0	96.0	4.0	100.0	84.5	15.5	100.0	71.8	28.2	100.0	84.
Ash	10.1	6.42	61.44	24.0	15.6	68.5	26.4	10.90	76.89	19.9	14.0
Total Sulfur	5.48	3.89	33.74	2.88	1.42	12.38	4.18	2.44	9.54	1.86	1.4
Calorific Content (Btu)	12,772	13,616	3,433	11,604	13,052	3,582	11,198	13,908	2,186	12,294	13,25
Percent:											
Available Btu	100.0	99.0	1.0	100.0	95.2	4.8	100.0	94.2	5.8	100.0	96.
										Conventional	
Percent:											
Yield	100.0	93.8	6.2	100.0	75.3	24.7	100.0	67.5	32.5	100.0	74.
Ash	10.1	5.36	58.04	24.0	11.5	61.5	26.4	8.38	73.37	19.9	8.5
Total Sulfur	5.48	3.63	27.10	2.88	1.24	8.91	4.18	2.02	9.48	1.86	1.3
Calorific Content (Btu)	12,772	13,792	4,380	11,604	13,774	4,902	11,198	14,383	2,750	12,294	14,17
Percent:											
Available Btu	100.0	97.9	2.1	100.0	89.5	10.5	100.0	91.6	8.4	100.0	91.0

UTILIZATION OF 3/8 INCH x 0 PHASE II COALS FOR COMBUSTION FEEDSTOCK

L. Freeport BCR No. 2881			Ft. Scott BCR No. 2889			L. Freeport BCR No. 2900			Baxter BCR No. 2926			Clements BCR No. 2928		
	Clean	Refuse	Raw	Clean	Refuse	Raw	Clean	Refuse	Raw	Clean	Refuse	Raw	Clean	Refuse
irect Two-Split														
.0	84.5	15.5	100.0	93.0	7.0	100.0	97.3	2.7	100.0	96.7	3.3	100.0	81.7	18.3
.9	14.04	75.92	13.3	8.24	67.26	15.0	14.03	57.71	14.8	12.39	60.87	25.3	11.57	79.89
86	1.44	5.09	4.21	3.74	9.89	3.36	2.84	25.33	4.02	3.62	17.97	1.96	1.88	2.56
	13,251	2,728	12,882	13,622	2,464	12,576	12,683	4,512	12,826	13,159	3,123	11,044	13,362	1,731
	96.4	3.6	100.0	98.7	1.3	100.0	99.0	1.0	100.0	99.2	0.8	100.0	97.2	2.8
ntional Two-Split														
	74.6	25.4	100.0	89.2	10.8	100.0	92.0	8.0	100.0	92.1	7.9	100.0	78.2	21.8
	8.58	67.82	13.3	6.08	64.30	15.0	12.00	52.18	14.8	10.18	58.46	25.3	9.36	76.82
	1.32	4.02	4.21	3.65	8.46	3.36	2.27	16.94	4.02	3.15	15.07	1.96	1.84	2.61
	14,177	4,111	12,882	14,004	3,233	12,576	13,038	5,845	12,826	13,589	3,956	11,044	13,738	2,252
	91.0	9.0	100.0	97.3	2.7	100.0	96.2	3.8	100.0	97.6	2.4	100.0	95.6	4.4

These values are included in Table 17, Summary Data Sheet, which details the ash fusion and has composition characteristics of the Phase II coals.

The R_s (slagging index) value has been used to identify the slagging tendency of coals as follows:

Slagging Tendency	R_s
Low	<0.6
Medium	0.6-2.0
High	2.0-2.6
Severe	>2.6

$$\left(R_s = \frac{\text{Base}}{\text{Acid}} \text{ (Sulfur)} \right)$$

Table 17 indicates the Western Kentucky No. 6, the Ft. Scott, and the Baxter coals fall in the "severe" slagging range. Each of these coals showed softening temperatures (under reducing conditions) less than 200 F with low silica, and high iron and calcium-magnesium percentages. Cleaning moved the slagging index of these three coals in the right direction; however, only the Baxter was improved to the point where it fell in the next lowest category (3.48 "severe" to 2.30 "high").

The R_f (fouling index) value is computed as the product of the base/acid ratio and the sodium content.

This is an indication of the tendency of coal ash to form high sintered-strength deposits on convection pass surfaces. A useful relation between this index and fouling has been found to be as follows:

Fouling Tendency	R_f
Low	<0.2
Medium	0.2-0.5
High	0.5-1.0
Severe	>1.0

$$\left(R_f = \frac{\text{Base}}{\text{Acid}} \text{ (Sodium)} \right)$$

TABLE 17. EFFECTS OF DIRECT CLEANING 3/8 INCH x 0 COAL RELATIVE

Lot No.	Coal Fraction	Chemical Analysis Percent, Dry Basis			Ash Fusibility, °F					
					Reducing Atmosphere			Oxidizing Atmospher		
		Weight	Ash	Total Sulfur	IDT	ST	FT	IDT	ST	FT
2847	Western Kentucky No. 6									
	As Received	100.0	10.1	5.5	1990	2000	2000	2485	2595	2610
	Washed Composite	96.0	6.4	3.9	1975	1995	2385	2485	2570	2605
2856	Bakerstown									
	As received	100.0	24.0	2.9	2095	2440	2718	2515	2605	2750
	Washed Composite	84.5	15.5	1.4	2370	2605	2750^{+}	2665	2725	2750
2860	Lower Kittanning									
	As received	100.0	26.4	4.2	2140	2460	2700	2570	2650	2750
	Washed Composite	71.8	19.9	2.4	2145	2470	2655	2555	2640	2750
2881	Lower Freeport									
	As received	100.0	19.9	1.9	2500	2630	2750^{+}	2750^{+}	2750^{+}	275
	Washed Composite	84.5	14.0	1.4	2545	2665	2750^{+}	2735	2750^{+}	2750
2889	Ft. Scott									
	As received	100.0	13.3	4.2	1890	1970	2065	2115	2135	2270
	Washed Composite	93.0	8.2	3.7	1915	1930	2180	2320	2440	2540
2900	Lower Freeport									
	As Received	100.0	15.0	3.4	2120	2340	2540	2560	2620	2700
	Washed Composite	97.3	14.0	2.9	2460	2520	2665	2670	2725	273
2926	Baxter									
	As received	100.0	14.8	4.0	1930	1970	2300	2260	2340	250
	Washed Composite	96.7	12.4	3.6	1935	1975	2370	2315	2430	256
2928	Clements									
	As Received	100.0	25.3	2.0	2700	2750^{+}	2750^{+}	2750^{+}	2750^{+}	275
	Washed Composite	81.7	11.7	1.9	2445	2610	2750^{+}	2750^{+}	2750^{+}	275

Washed Composite = Zones A, B, and C

IDT = Initial Deformation Temperatu
ST = Softening Temperature
FT = Fluid Temperature

O COAL RELATIVE TO ITS POWER GENERATION POTENTIAL

y, °F izing Atmosphere		Ash Composition Percent, - Dry Basis								Combustion Indices	
ST	FT	SiO_2	Al_2O_3	Fe_2O_3	MgO	CaO	TiO_2	Na_2O	K_2O	R_s	R_F
2595	2610	33.0	13.0	48.0	0.4	1.3	0.6	0.2	1.0	6.01	0.22
2570	2605	30.8	15.9	45.1	0.4	1.7	0.7	0.3	1.3	4.02	0.31
2605	2750+	53.5	23.0	16.4	1.1	1.5	1.2	0.3	2.8	0.82	0.09
2725	2750+	57.5	24.9	9.6	0.9	2.2	1.5	0.4	1.9	0.27	0.02
2650	2750+	50.0	24.6	18.7	0.4	0.9	1.5	0.3	1.7	1.21	0.09
2640	2750+	45.5	24.2	21.0	0.4	2.2	1.5	0.3	1.6	0.90	0.11
2750+	2750+	55.0	27.6	10.8	0.8	0.8	1.6	0.2	3.2	0.36	0.04
2750+	2750+	50.6	30.1	12.1	0.6	1.2	1.4	0.3	2.7	0.29	0.06
2135	2270	38.6	9.5	27.3	0.8	20.2	0.5	0.7	2.0	4.40	0.74
2440	2540	35.7	12.4	37.5	0.8	9.2	0.6	0.8	0.6	3.80	0.82
2620	2700	45.0	25.0	23.5	0.6	0.7	1.0	0.2	2.2	1.30	0.08
2725	2735	48.1	27.1	19.2	0.6	0.8	1.1	0.2	2.1	0.90	0.06
2340	2505	38.1	15.3	29.1	0.8	12.5	0.7	0.4	1.6	3.48	0.30
2430	2565	43.5	17.3	26.1	0.8	7.4	0.8	0.4	2.6	2.30	0.25
2750+	2750+	55.0	30.5	7.7	0.8	1.0	1.3	0.3	2.1	0.28	0.04
2750+	2750+	47.9	29.6	14.0	0.9	1.7	1.1	0.6	2.2	0.46	0.14

ion Temperature
ature

$R_S = \frac{\text{Base}}{\text{Acid}}$ (Sulfur %)

$R_F = \frac{\text{Base}}{\text{Acid}}$ (Sodium %)

None of the coals used in this sequence produced coal ash having "severe" fouling characteristics but the "bad actors" relative to slagging showed the greatest tendency for fouling. The Ft. Scott seam from Rogers County, Oklahoma (BCR 2889) in particular, produced the highest R_f. As shown in Table 17, this condition was not essentially changed by washing.

IV. CONCLUSIONS

Comprehensive two-stage concentrating table cleaning is one of the most effective means for removing pyrite from fine sized coal. This particular sequence of coals, however, did not respond in the manner expected from previous Phase I washability analyses.

Since the 1.60 float composite was consistent with the ABC Zone composite, the table was apparently operating properly. The sulfur reductions projected from Phase I results, however, were not realized. In the 3/8 inch x 0 run, high quantities of fine clay tended to obstruct efficient zone classification but the secondary pulverization and recleaning should have facilitated sulfur release.

The Bakerstown and Lower Kittanning coals showed the most favorable potential for wet table beneficiation. Sulfur reductions achieved would greatly alleviate the load placed on boilers and stack scrubbers in plants using these coals for power generation.

Power plants presently burning raw coals would benefit by washing, not only from the decided decrease in sulfurous emittants but also in the higher Btu/lb calorific content and substantially reduced slagging potential.

Appendix A

CONCENTRATING TABLE AND PYRITE BENEFICIATION DATA

Tables	Seam	BCR Lot No.
A1 - A10	Western Ky. No. 6	2847
A11 - A20	Bakerstown	2856
A21 - A30	L. Kittanning	2860
A31 - A40	L. Freeport	2881
A41 - A50	Ft. Scott	2889
A51 - A60	L. Freeport	2900
A61 - A70	Baxter	2926
A71 - A80	Clements	2928

Moisture as reported on all Tables is the moisture of the sample as received in the analytical laboratory. This value is used to place other analyses on a dry basis.

Table A1

Screen Analysis

Coal Identification No. 6 Seam, Butler County, Kentucky

BCR Sample No. 2847

Raw Run-of-mine Coal Crushed to 3/8 Inch x 0

Screen Size	Weight Percent	Cumulative
Plus 1/4 inch	12.3	12.3
1/4 Inch x 6 M	30.8	43.1
6 M x 12 M	21.3	64.4
Minus 12 M	35.6	100.0
Total	100.0	

Zones A, B, and C From 3/8 Inch x 0 Run (6-18-71) Crushed to 30 Mesh x 0

Screen Size	Weight Percent	Cumulative
Plus 30 M	11.1	11.1
30 M x 50 M	31.9	43.0
50 M x 100 M	23.7	66.7
Minus 100 M	33.3	100.0
Total	100.0	

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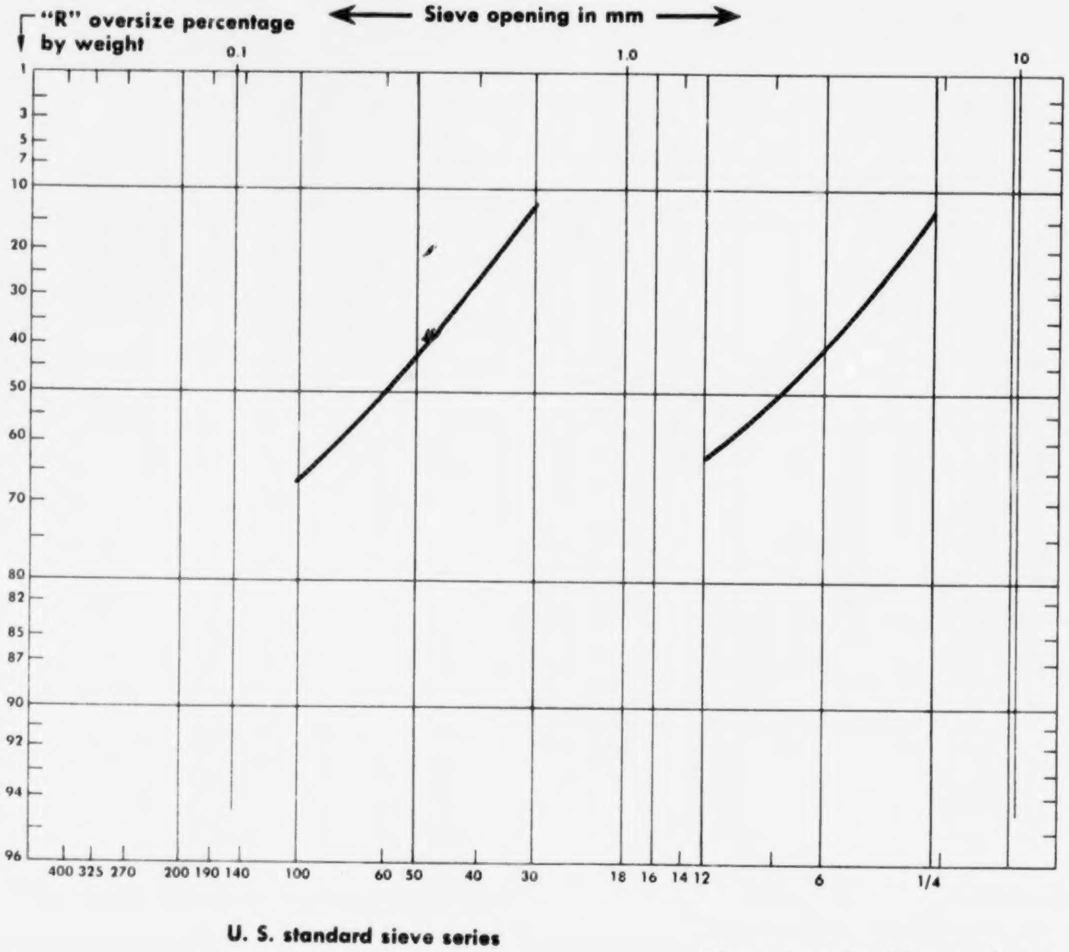

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Figure A-1. Size Distribution Curves of 30 Mesh × 0 and 3/8 Inch × 0 Concentrating Table Feed for No. 6 Seam, Butler County, Kentucky, BCR Sample No. 2847

Table A2

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table Tests--3/8 Inch x 0 Rough Cleaning and Pyrite Precleaning

Coal Identification No. 6 Seam, Butler County, Kentucky

Raw Run-of-mine Coal Crushed to 3/8 Inch x 0

BCR Sample No. 2847

Table Products	Product Weight, Percent	Float and Sink Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
			Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	26.9		2.02	5.98	3.47	
Zone B	43.2		2.20	4.88	3.53	
Zone C						
Float at 1.60	23.7	91.3	1.52	5.52	3.98	
1.60 by 1.90	0.8	3.3	1.66	29.2	10.9	
Sink at 1.90	1.4	5.4	0.77	64.8	17.4	
Composite	25.9	100.0		9.50	4.93	
Zone D						
Float at 1.90	0.2	11.4	1.50	15.4	9.32	
1.90 by 2.95	0.7	38.3	0.66	67.2	15.6	
Sink at 2.95	0.9	50.3	0.36	62.9	43.4	
Composite	1.8	100.0		59.1	28.9	
Zone E						
Float at 2.95	0.5	20.8	0.96	61.8	14.6	
Sink at 2.95	1.7	79.2	0.34	63.6	44.6	
Composite	2.2	100.0		63.2	38.4	
Composite of Zones A, B, C	96.0			6.44	3.89	
Composite of 1.60 Float Fractions	93.8			5.36	3.63	
Composite of 2.95 Sink Fractions	2.6			63.4	44.2	
Composite of Table Products	100.0			8.63	5.10	
Analysis of Feed to Table			1.36	10.1	5.48	

Run Date: 6-18-71

Table A3

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table Tests--30 Mesh x 0 Deep Cleaning

Coal Identification No. 6 Seam, Butler County, Kentucky

Zones A, B, and C, 3/8 Inch x 0 Run (6-18-71) Crushed to 30 Mesh x 0

BCR Sample No. 2847

Table Products	Product Weight Percent	Float and Sink Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
			Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	83.2		2.41	4.82	3.74	
Zone B	13.7		1.51	4.84	3.92	
Zone C						
Float at 1.60	1.1	94.9	1.73	6.56	4.94	
Sink at 1.60	0.1	5.1	1.00	54.0	18.9	
Composite	1.2	100.0		8.98	5.65	
Zone D						
Float at 1.60	0.7	53.0	2.32	14.1	9.16	
1.60 by 2.95	0.6	41.1	1.04	46.5	14.4	
Sink at 2.95	0.1	5.9	0.46	63.6	41.8	
Composite	1.4	100.0		30.3	13.2	
Zone E						
Float at 2.95	0.25	49.7	0.80	55.0	17.5	
Sink at 2.95	0.25	50.3	0.34	63.0	42.4	
Composite	0.5	100.0		59.0	30.0	
Composite of Zones A, B, C	98.1			4.87	3.79	
Composite of 1.60 Float Fractions	98.7			4.91	3.82	
Composite of 2.95 Sink Fractions	0.35			63.2	42.2	
Composite of Table Products	100.0			5.50	4.05	
Analysis of Feed to Table			1.76	5.98	4.09	

Run Date: 6-25-71

Table A4

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table Tests--Effects of Two-stage Cleaning

Coal Identification No. 6 Seam, Butler County, Kentucky

Composite of 3/8 Inch x 0 Run (6-18-71) and 30 Mesh x 0 Run (6-25-71)

BCR Sample No. 2847

Table Products	Product Weight Percent	Float and Sink Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
			Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	79.9			4.82	3.74	
Zone B	13.2			4.84	3.92	
Zone C						
Float at 1.60	1.0	94.9		6.56	4.94	
Sink at 1.60	0.1	5.1		54.0	18.9	
Composite	1.1	100.0		8.98	5.65	
Zone D						
Float at 1.60						
1.60 by 2.95	2.1	67.7		39.8	12.6	
Sink at 2.95	1.0	32.3		63.0	43.2	
Composite	3.1	100.0		47.3	22.5	
Zone E						
Float at 2.95	0.75	27.8		59.5	15.6	
Sink at 2.95	1.95	72.2		63.5	44.3	
Composite	2.7	100.0		62.4	36.3	
Composite of Zones A, B, C	94.2			4.87	3.79	
Composite of 1.60 Float Fractions	94.1			4.84	3.78	
Composite of 2.95 Sink Fractions	2.95			63.3	43.9	
Composite of Table Products	100.0			7.74	5.25	
Analysis of Feed to Table			1.36	10.1	5.48	

Table A5

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table No. 15-S Tests - Pyrite Beneficiation

Coal Identification No. 6 Seam, Butler County, Kentucky

Zone E, 3/8 Inch x 0 Run (6-18-71) Crushed to 30 Mesh x 0

BCR Sample No. 2847

Table Products	Product, Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
		Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	7.7	0.74	55.0	27.8	
Zone B	7.4	0.76	55.1	27.2	
Zone C	4.5	0.88	51.0	23.7	
Zone D	31.5	0.39	63.8	33.4	
Zone E	48.9	0.26	64.7	44.9	
Composite of Table Products	100.0		62.3	37.7	
Analysis of Feed to Table		0.32	62.8	38.4	

Run Date: 7-1-71

Table A6

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table No. 15-S Tests - Pyrite Beneficiation

Coal Identification No. 6 Seam, Butler County, Kentucky

Zone D, 30 Mesh x 0 Run (7-1-71) Crushed to 60 Mesh x 0

BCR Sample No. 2847

Table Products	Product, Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
		Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	15.5	0.42	61.4	29.4	
Zone B	39.1	0.60	61.0	28.2	
Zone C	15.8	0.61	58.8	27.7	
Zone D	15.5	0.34	73.0	20.8	
Zone E	14.1	0.18	65.2	44.0	
Composite of Table Products	100.0		63.2	29.4	
Analysis of Feed to Table		0.30	63.4	30.5	

Run Date: 7-7-71

Table A7

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Pyrite Beneficiation - Effects of Two-stage Cleaning

Coal Identification No. 6 Seam, Butler County, Kentucky

BCR Sample No. 2847

Pyrite Precleaning

Concentrating Table No. 14 Test Run Date 6-18-71

Feed to Concentrating Table: Raw Run-of-mine Coal Crushed to 3/8 Inch x 0

	Product, Weight %	Chemical Analysis, Dry Basis, Weight % Ash	Total Sulfur
Analysis of Feed to Table		10.1	5.48
Zone E (Pyrite Zone)	2.2	63.2	38.4

Pyrite Cleaning

Concentrating Table No. 15-S Test Run Date 7-1-71

Feed to Concentrating Table: Zone E, 3/8 Inch x 0 Run (6-18-71) Crushed to 30 Mesh x 0

	Product, Weight %	Chemical Analysis, Dry Basis, Weight % Ash	Total Sulfur
Analysis of Feed to Table		62.8	38.4
Zone E (Pyrite Zone)	48.9	64.7	44.9

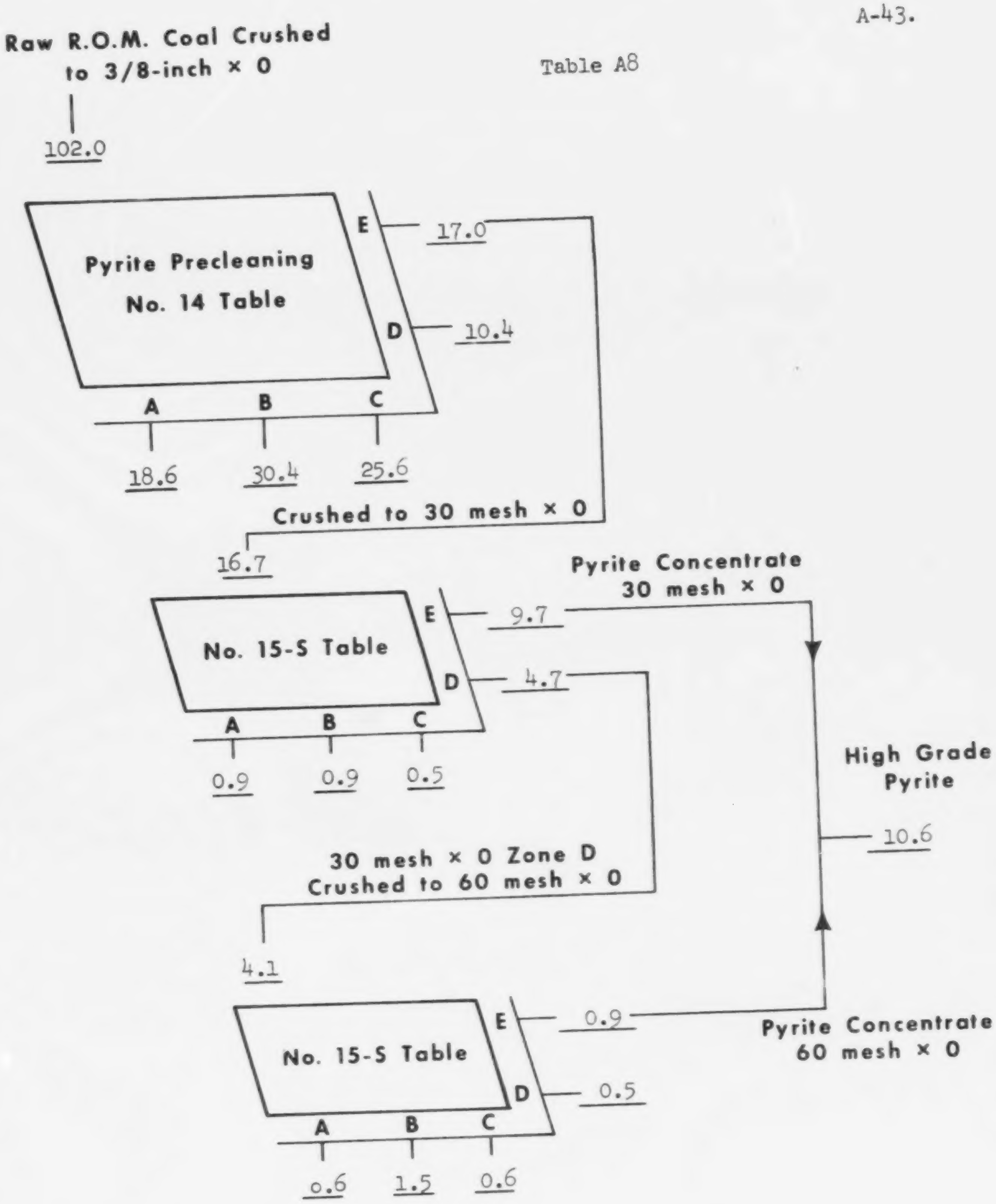
Concentrating Table No. 15-S Test Run Date 7-7-71

Feed to Concentrating Table: Zone D, 30 M x 0 Run (7-1-71) Crushed to 60 Mesh x 0

	Product, Weight %	Chemical Analysis, Dry Basis, Weight % Ash	Total Sulfur
Analysis of Feed to Table		63.4	30.5
Zone E (Pyrite Zone)	14.1	65.2	44.0

Two Stage Pyrite Product	1.2	64.7	44.8

Table A8


Raw R.O.M. Coal Crushed
to 3/8-inch × 0
102.0
Pyrite Precleaning
No. 14 Table
E
17.0
D
10.4
A
B
C
18.6
30.4
25.6
Crushed to 30 mesh × 0
16.7
No. 15-S Table
Pyrite Concentrate
30 mesh × 0
E
9.7
D
4.7
A
B
C
0.9
0.9
0.5
High Grade
Pyrite
10.6
30 mesh × 0 Zone D
Crushed to 60 mesh × 0
4.1
No. 15-S Table
E
0.9
Pyrite Concentrate
60 mesh × 0
D
0.5
A
B
C
0.6
1.5
0.6

Flowsheet for Pyrite Benefication Tests

No. 6 Seam, Butler County, Kentucky
BCR Sample No. 2847

Pounds of Total Sulfur/Ton of
Run-of-mine Coal

Table A9

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Flowsheet Data for Pyrite Beneficiation Tests

Coal Identification No. 6 Seam, Butler County, Kentucky

BCR Sample No. 2847

Fraction	Weight Percent		Chemical Analysis, Dry Basis Weight Percent	
			Ash	Total Sulfur
Table No. 14				
Zone A	26.9		5.98	3.47
Zone B	43.2		4.88	3.53
Zone C	25.9		9.50	4.93
Zone D	1.8		59.1	28.9
Zone E		2.2	63.2	38.4
Table No. 15-S (30 Mesh x 0)				
Zone A	0.2		55.0	27.8
Zone B	0.1		55.1	27.2
Zone C	0.1		51.0	23.7
Zone D		0.7	63.8	33.4
Zone E	1.1		64.7	44.9
Table No. 15-S (60 Mesh x 0)				
Zone A	0.11		61.4	29.4
Zone B	0.27		61.0	28.2
Zone C	0.11		58.8	27.7
Zone D	0.11		73.0	20.8
Zone E	0.10		65.2	44.0
Composite of Fractions	100.0		8.61	5.06
Analysis of Feed Coal			10.1	5.48

Table A10

Evaluation of Coal Cleaning Processe
for Removing Pyritic Sulfur fro

Concentrating Table Tests--3/8 Inch x

Ash Characteristics

Coal Identification No. 6 Seam, Butler County, Kentucky
Raw Run-of-mine Coal Crushed to 3/8

Table Products	Product Weight Percent	Float and Sink Weight %	Chemical Analysis, Dry Basis, Weight Percent							Reduc
			Moisture	Ash	Total Sulfur	Sulfate Sulfur	Pyritic Sulfur	Organic Sulfur	Btu/lb	IDT
Zone A	26.9		2.02	5.98	3.47	--	2.61	0.86	13,685	1945
Zone B	43.2		2.20	4.88	3.53	--	2.62	0.91	13,896	1995
Zone C			1.65	9.54	4.94	--	4.24	0.70	13,078	1965
1.60 Float	23.6	91.3	1.52	5.52	3.98	--	3.09	0.89	13,725	2000
1.60 by 1.90	0.9	3.3	1.66	29.2	10.9	0.07	10.3	0.54	9,592	1975
1.90 Sink	1.4	5.4	0.77	64.8	17.4	0.11	17.1	0.22	4,104	1960
Composite	25.9	100.0		9.50	4.93	0.01	4.08	0.84	13,069	
Zone D			0.45	58.4	29.6	0.16	29.1	0.34	4,706	2075
1.90 Float	0.2	11.4	1.50	15.4	9.32	0.04	8.59	0.69	11,956	2050
1.90 by 2.95	0.7	38.3	0.66	67.2	15.6	0.13	15.3	0.17	3,651	1965
2.95 Sink	0.9	50.3	0.36	62.9	43.4	0.28	42.9	0.18	2,510	2430
Composite	1.8	100.0		59.1	28.9	0.20	28.42	0.23	4,024	
Zone E			0.20	63.4	39.3	0.23	38.8	0.22	3,524	2100
2.95 Float	0.5	20.8	0.96	61.8	14.6	0.13	14.2	0.24	4,692	1970
2.95 Sink	1.7	79.2	0.34	63.6	44.6	0.39	44.0	0.22	2,460	2420
Composite	2.2	100.0		63.2	38.4	0.34	37.8	0.22	2,924	
Composite of Table Products	100.0			8.63	5.10	0.01	4.23	0.85	13,206	
Analysis of Feed to Table			1.36	10.1	5.48	0.02	4.66	0.80	12,772	1990

Run Date: 6-18-71

e A10

ng Processes and Techniques
Sulfur from Fine Coal

3/8 Inch x 0 Rough Cleaning

teristics

, Kentucky

hed to 3/8 Inch x 0

BCR Sample No. 2847

	Ash Fusibility								Ash Spectrography								
	Reducing Atmosphere				Oxidizing Atmosphere												
lb	IDT	ST,S	ST,H	FT	IDT	ST,S	ST,H	FT	SiO_2	Al_2O_3	Fe_2O_3	MgO	CaO	TiO_2	Na_2O	K_2O
85	1945	1970		2400	2460	2560		2580	34.5	17.0	40.0	0.56	1.85	0.76	0.34	1.7
96	1995	2020		2460	2495	2580		2635	26.5	16.3	49.0*	0.44	2.00	0.70	0.24	1.2
78	1965	1975		2240	2495	2570		2590	34.0	14.0	44.0	0.29	1.11	0.63	0.17	1.0
25	2000	2030		2530	2560	2680		2750+	21.1	15.8	55.0*	0.48	1.80	0.72	0.22	0.8
92	1975	2000		2420	2540	2565		2585	29.5	18.0	46.0*	0.50	0.58	0.60	0.13	1.5
04	1960	1980		2320	2520	2575		2620	48.0	10.0	37.0	0.38	0.48	0.68	0.10	1.5
69																
06	2075	2085		2170	2615	2635		2650	27.5	5.9	63.0*	<0.2	0.46	0.32	0.05	1.2
56	2050	2065		2165	2610	2750+		2750+	17.0	10.8	68.0*	0.32	0.70	0.48	0.09	0.9
51	1965	2005		2465	2500	2575		2625	51.0	10.4	33.0	0.38	0.63	0.70	0.09	1.8
10	2430	2435		2440	2750+	2750+		2750+	5.2*	1.9*	90.0*	0.22	0.33	0.13	<0.02	<0.1
24																
24	2100	2160		2270	2680	2750+		2750+	16.2	3.6	78.0*	<0.2	0.39	0.15	0.02	0.6
92	1970	1995		2485	2500	2585		2635	54.0	9.3	33.0	0.36	0.61	0.70	0.08	1.4
60	2420	2435		2450	2750+	2750+		2750+	4.6*	1.9*	90.0*	0.26	0.35	0.13	<0.02	<0.1
924																
206																
772	1990	2000		2200	2485	2595		2610	33.0	13.0	48.0*	0.38	1.32	0.61	0.20	1.0

IDT - Initial Deformation Temperature
ST,S - Softening Temperature, Spherical
ST,H - Softening Temperature, Hemispherical
FT - Fluid Temperature

* Extrapolated Value

Table A11

Screen Analysis

Coal Identification Bakerstown Seam, Grant County, West Virginia

BCR Sample No. 2856

Raw Run-of-mine Coal Crushed To 3/8 Inch x 0

Screen Size	Weight Percent	Cumulative
Plus 1/4"	9.3	9.3
1/4" x 6 M	23.5	32.8
6 M x 12 M	21.2	54.0
Minus 12 M	46.0	100.0
Total	100.0	

Zones A, B, and C From 3/8 Inch x 0 Run (7-16-71) Crushed To 30 Mesh x 0

Screen Size	Weight Percent	Cumulative
Plus 30 M	6.6	6.6
30 M x 50 M	29.3	35.9
50 M x 100 M	24.5	60.4
Minus 100 M	39.6	100.0

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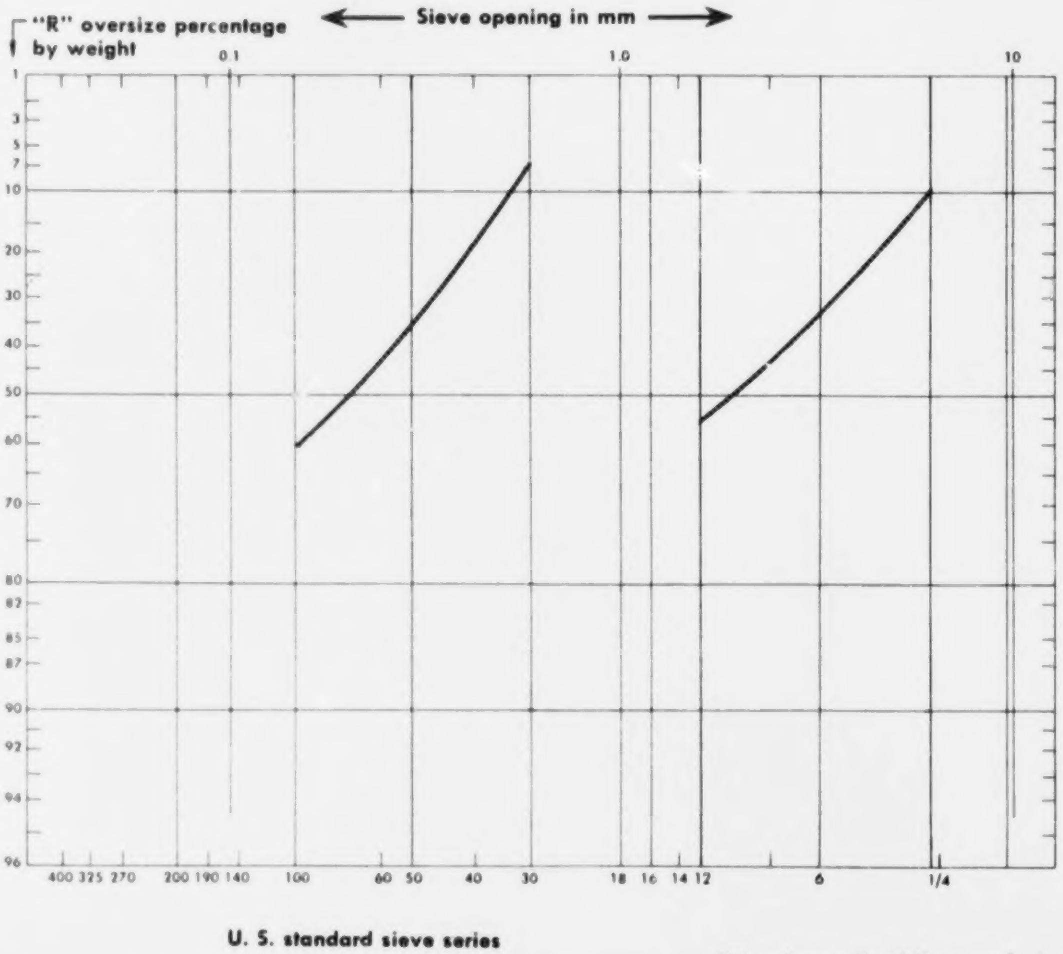


Bituminous Coal Research, Inc. 6076G7

Figure A-2. Size Distribution Curves of 30 Mesh × 0 and 3/8 Inch × 0 Concentrating Table Feed for Bakerstown, Grant County, West Virginia, BCR Sample No. 2856

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table Tests--3/8 Inch x 0 Rough Cleaning and Pyrite Precleaning

Coal Identification Bakerstown Seam, Grant County, West Virginia

Raw Run-of-mine Coal Crushed To 3/8 Inch x 0

BCR Sample No. 2856

Table Products	Product Weight Percent	Float and Sink Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
			Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	47.3		0.34	10.2	1.23	
Zone B	22.0		0.28	13.0	1.24	
Zone C						
Float at 1.60	6.0	39.7	0.34	15.8	1.35	
1.60 by 1.90	6.6	43.4	0.45	45.2	2.02	
Sink at 1.90	2.6	16.9	0.44	60.5	5.22	
Composite	15.2	100.0		36.1	2.29	
Zone D						
Float at 1.90	2.1	17.3	0.22	36.2	1.86	
1.90 by 2.95	8.6	71.2	0.36	77.8	4.89	
Sink at 2.95	1.4	11.5	0.20	61.0	38.6	
Composite	12.1	100.0		68.4	8.24	
Zone E						
Float at 2.95	1.3	39.1	0.80	79.2	6.34	
Sink at 2.95	2.1	60.9	0.22	62.0	40.5	
Composite	3.4	100.0		68.7	27.1	
Composite of Zones A, B, C	84.5			15.6	1.42	
Composite of 1.60 Float Fractions	75.3			11.5	1.24	
Composite of 2.95 Sink Fractions	3.5			61.6	39.7	
Composite of Table Products	100.0			23.8	3.12	
Analysis of Feed to Table			0.66	24.0	2.88	

Run Date: 7-16-71

Table A13

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table Tests--30 Mesh x 0 Deep Cleaning

Coal Identification Bakerstown Seam, Grant County, West Virginia

Zones A, B, and C, 3/8 Inch x 0 Run (7-16-71) Crushed To 30 Mesh x 0

BCR Sample No. 2856

Table Products	Product Weight Percent	Float and Sink Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
			Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	81.8		0.61	12.0	1.09	
Zone B	10.0		0.47	15.1	1.12	
Zone C						
Float at 1.60	0.7	71.3	0.47	18.9	1.14	
Sink at 1.60	0.3	28.7	0.42	43.8	2.94	
Composite	1.0	100.0		26.0	1.66	
Zone D						
Float at 1.60	0.6	9.4	0.62	27.3	1.16	
1.60 by 2.95	5.8	87.4	0.68	55.2	2.20	
Sink at 2.95	0.2	3.2	0.18	61.0	43.1	
Composite	6.6	100.0		52.8	3.41	
Zone E						
Float at 2.95	0.1	17.8	0.69	68.2	13.0	
Sink at 2.95	0.5	82.2	0.22	62.1	44.1	
Composite	0.6	100.0		63.2	38.6	
Composite of Zones A, B, C	92.8			12.5	1.10	
Composite of 1.60 Float Fractions	93.1			12.5	1.09	
Composite of 2.95 Sink Fractions	0.7			61.8	43.8	
Composite of Table Products	100.0			15.5	1.48	
Analysis of Feed to Table			0.50	16.4	1.65	

Run Date: 7-27-71

Table A14

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table Tests--Effects of Two-stage Cleaning

Coal Identification Bakerstown Seam, Grant County, West Virginia

Composite of 3/8 Inch x 0 Run (7-16-71) and 30 Mesh x 0 Run (7-27-71)

BCR Sample No. 2856

Table Products	Product Weight Percent	Float and Sink Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
			Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	69.1			12.0	1.09	
Zone B	8.5			15.1	1.12	
Zone C						
Float at 1.60	0.6	71.3		18.9	1.14	
Sink at 1.60	0.2	28.7		43.8	2.94	
Composite	0.8	100.0		26.0	1.66	
Zone D						
Float at 2.95	16.1	91.0		63.7	3.56	
Sink at 2.95	1.6	9.0		61.0	39.2	
Composite	17.7	100.0		63.5	6.77	
Zone E						
Float at 2.95	1.4	35.9		78.4	6.81	
Sink at 2.95	2.5	64.1		62.0	41.1	
Composite	3.9	100.0		67.9	28.8	
Composite of Zones A, B, C	78.4			12.5	1.10	
Composite of 1.60 Float Fractions	78.2			12.4	1.09	
Composite of 2.95 Sink Fractions	4.1			61.6	40.4	
Composite of Table Products	100.0			23.7	3.18	
Analysis of Feed to Table			0.66	24.0	2.88	

Table A15

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table No. 15-S Tests - Pyrite Beneficiation

Coal Identification Bakerstown Seam, Grant County, West Virginia

Zone E, 3/8 Inch x 0 Run (7-16-71) Crushed To 30 Mesh x 0

BCR Sample No. 2856

Table Products	Product, Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
		Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	11.0	0.49	60.3	24.4	
Zone B	9.9	0.47	60.8	22.7	
Zone C	3.9	0.50	59.9	22.0	
Zone D	47.0	0.50	76.8	18.6	
Zone E	28.2	0.18	64.5	44.6	
Composite of Table Products	100.0		69.3	27.1	
Analysis of Feed to Table			68.7	27.1	

Run Date: 7-28-71

Table A16

Evaluation of Coal Cleaning Processes and Techniques
for Removing Pyritic Sulfur from Fine Coal

Concentrating Table No. 15-S Tests - Pyrite Beneficiation

Coal Identification Bakerstown Seam, Grant County, West Virginia

Zone D, 30 Mesh x 0 Run (7-28-71) Crushed To 60 Mesh x 0

BCR Sample No. 2856

Table Products	Product, Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
		Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	24.0	0.43	74.4	20.4	
Zone B	35.4	0.64	75.3	19.4	
Zone C	13.8	0.38	76.0	15.8	
Zone D	14.0	0.68	78.2	17.4	
Zone E	12.8	0.26	69.3	39.8	
Composite of Table Products	100.0		74.8	21.5	
Analysis of Feed to Table		0.34	75.1	21.2	

Run Date: 7-29-71

Table A17

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Pyrite Beneficiation - Effects of Two-stage Cleaning

Coal Identification Bakerstown Seam, Grant County, West Virginia

BCR Sample No. 2856

Pyrite Precleaning

Concentrating Table No. 14 Test — Run Date 7-16-71

Feed to Concentrating Table: Raw Run-of-mine Coal Crushed To 3/8 Inch x 0

	Product, Weight %	Chemical Analysis,	Dry Basis, Weight %
		Ash	Total Sulfur
Analysis of Feed to Table		24.0	2.88
Zone E (Pyrite Zone)	3.4	68.7	27.1

Pyrite Cleaning

Concentrating Table No. 15-S Test — Run Date 7-28-71

Feed to Concentrating Table: Zone E, 3/8 Inch x 0 Run (7-16-71) Crushed To 30 Mesh x 0

	Product, Weight %	Chemical Analysis,	Dry Basis, Weight %
		Ash	Total Sulfur
Analysis of Feed to Table		68.7	27.1
Zone E (Pyrite Zone)	28.2	64.5	44.6

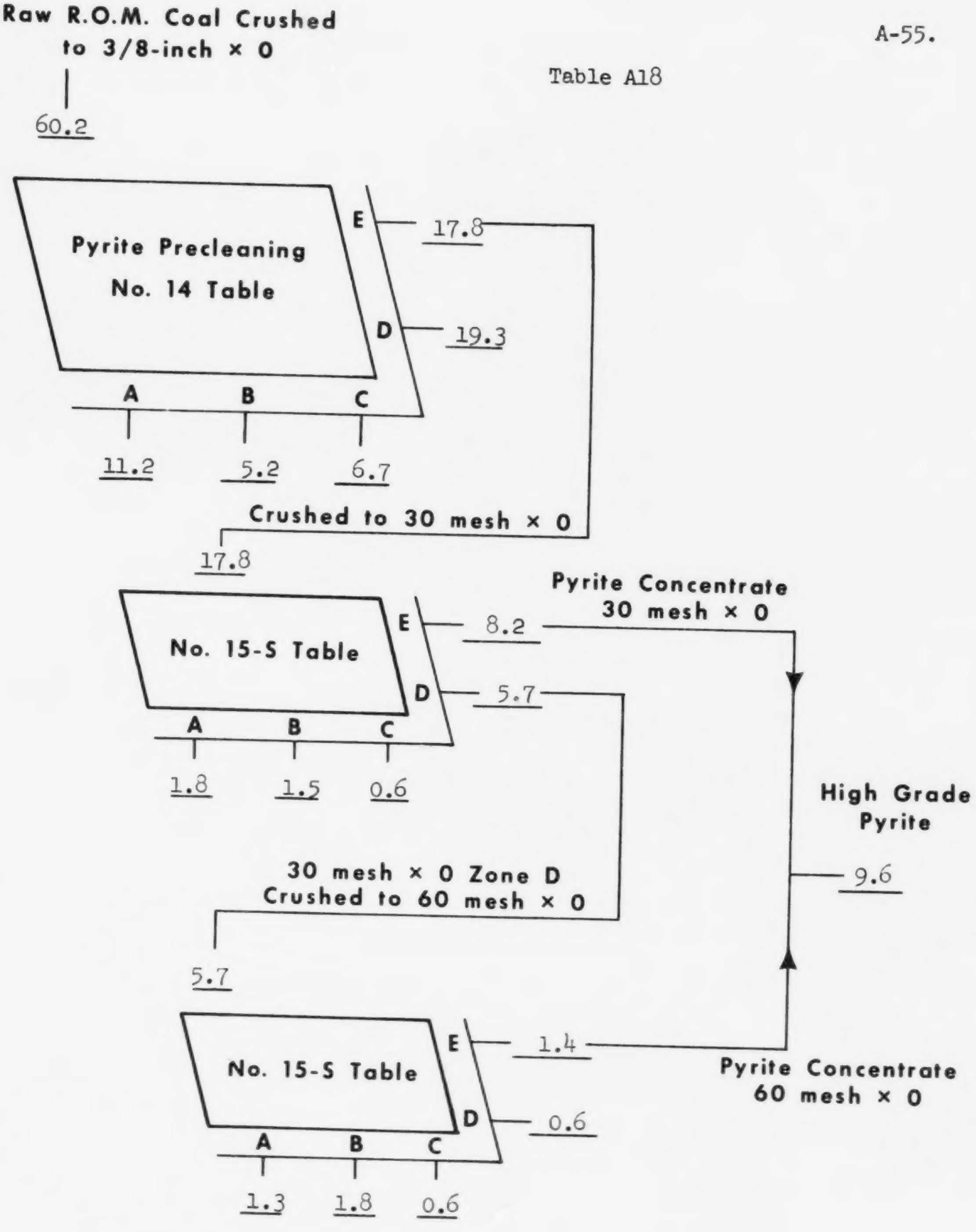
Concentrating Table No. 15-S Test — Run Date 7-29-71

Feed to Concentrating Table: Zone D, 30 Mesh x 0 Run (7-28-71) Crushed To 60 Mesh x 0

	Product, Weight %	Chemical Analysis,	Dry Basis, Weight %
		Ash	Total Sulfur
Analysis of Feed to Table		75.1	21.2
Zone E (Pyrite Zone)	12.8	69.3	39.8

Two Stage Pyrite Product	1.2	65.3	43.8

Table A18


Raw R.O.M. Coal Crushed
to 3/8-inch × 0
60.2
Pyrite Precleaning
No. 14 Table
E
17.8
D
19.3
A
B
C
11.2
5.2
6.7
Crushed to 30 mesh × 0
17.8
No. 15-S Table
Pyrite Concentrate
30 mesh × 0
E
8.2
D
5.7
A
B
C
1.8
1.5
0.6
High Grade
Pyrite
9.6
30 mesh × 0 Zone D
Crushed to 60 mesh × 0
5.7
No. 15-S Table
E
1.4
Pyrite Concentrate
60 mesh × 0
D
0.6
A
B
C
1.3
1.8
0.6

Flowsheet for Pyrite Benefication Tests

Bakerstown Seam, Grant County, West Virginia
BCR Sample No. 2856

Pounds of Total Sulfur/Ton of
Run-of-mine Coal

Table A19

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Flowsheet Data for Pyrite Beneficiation Tests

Coal Identification Bakerstown Seam, Grant County, West Virginia

BCR Sample No. 2856

Fraction	Weight Percent		Chemical Analysis, Dry Basis Weight Percent Ash	Chemical Analysis, Dry Basis Weight Percent Total Sulfur
Table No. 14				
Zone A	47.3		10.2	1.23
Zone B	22.0		13.0	1.24
Zone C	15.2		36.1	2.29
Zone D	12.1		68.4	8.24
Zone E		3.4	68.7	27.1
Table No. 15-S (30 Mesh x 0)				
Zone A	0.4		60.3	24.4
Zone B	0.3		60.8	22.7
Zone C	0.1		59.9	22.0
Zone D		1.6	76.8	18.6
Zone E	1.0		64.5	44.6
Table No. 15-S (60 Mesh x 0)				
Zone A	0.4		74.4	20.4
Zone B	0.6		75.3	19.4
Zone C	0.2		76.0	15.8
Zone D	0.2		78.2	17.4
Zone E	0.2		69.3	39.8
Composite of Fractions	100.0		23.8	3.18
Analysis of Feed Coal			24.0	2.88

Evaluation of Coal Cleaning Processes
for Removing Pyritic Sulfur from

Concentrating Table Tests--3/8 Inch x 0

Ash Characteristics

Coal Identification Bakerstown Seam, Grant County, West Vi

Raw Run-of-mine Coal Crushed To 3/8 In

Table Products	Product Weight Percent	Float and Sink Weight %	Chemical Analysis, Dry Basis, Weight Percent							Reducin	
			Moisture	Ash	Total Sulfur	Sulfate Sulfur	Pyritic Sulfur	Organic Sulfur	Btu/lb	IDT	ST,
Zone A	47.3		0.34	10.2	1.23		0.71	0.52	14,014	2305	258
Zone B	22.0		0.28	13.0	1.24		0.64	0.60	13,490	2410	262
Zone C			0.24	35.6	2.46		2.01	0.45	9,576	2520	267
1.60 Float	6.0	39.7	0.34	15.8	1.35		0.90	0.45	12,921	2660	275
1.60 by 1.90	6.6	43.4	0.45	45.2	2.02		1.61	0.41	7,891	2665	275
1.90 Sink	2.6	16.9	0.44	60.5	5.22		4.97	0.25	5,144	2175	246
Composite	15.2	100.0		36.1	2.29		1.89	0.40	9,424		
Zone D			0.30	69.8	8.80		8.66	0.14	3,656	2060	216
1.90 Float	2.1	17.3	0.22	36.2	1.86		1.50	0.36	9,426	2650	275
1.90 by 2.95	8.6	71.2	0.36	77.8	4.89		4.82	0.07	2,354	2240	241
2.95 Sink	1.4	11.5	0.20	61.0	38.6	0.08	38.4	0.12	3,870	2440	245
Composite	12.1	100.0		68.4	8.24	0.01	8.11	0.12	3,752		
Zone E			0.17	69.0	27.8	0.08	27.5	0.22	3,092	2030	205
2.95 Float	1.3	39.1	0.80	79.2	6.34	0.02	6.25	0.07	2,067	2170	223
2.95 Sink	2.1	60.9	0.22	62.0	40.5	0.13	40.2	0.15	3,565	2400	241
Composite	3.4	100.0		68.7	27.1	0.09	26.9	0.12	2,979		
Composite of Table Products	100.0			23.8	3.12		2.66	0.46	11,584		
Analysis of Feed to Table			0.66	24.0	2.88		2.42	0.46	11,604	2095	244

Run Date: 7-16-71

IDT
ST,S
ST,H
FT

ocesses and Techniques
ur from Fine Coal

nch x 0 Rough Cleaning

tics

West Virginia

3/8 Inch x 0

BCR Sample No. 2856

Ash Fusibility

Reducing Atmosphere				Oxidizing Atmosphere				Ash Spectrography							
DT	ST,S	ST,H	FT	IDT	ST,S	ST,H	FT	SiO_2	Al_2O_3	Fe_2O_3	MgO	CaO	TiO_2	Na_2O	K_2O
05	2580		2750	2630	2705		2750+	57.5	24.2	9.80	0.84	2.75	1.52	0.43	1.6
10	2620		2750+	2705	2750+		2750+	58.0	25.9	9.20	0.87	1.85	1.60	0.38	1.9
20	2670		2750+	2705	2750+		2750+	57.0	25.9	9.80	1.06	0.80	1.52	0.29	2.6
60	2750		2750+	2750+	2750+		2750+	56.0	28.5	9.20	0.76	1.25	1.56	0.20	1.7
65	2750+		2750+	2750+	2750+		2750+	58.0	27.5	7.70	1.22	0.51	1.47	0.35	1.3
75	2465		2680	2560	2670		2750+	54.5	24.0	13.8	1.40	1.25	1.33	0.16	1.5
60	2160		2635	2460	2555		2665	53.5	20.9	19.7	1.05	1.16	1.00	0.14	1.6
50	2750+		2750+	2750+	2750+		2750+	58.0	28.5	7.40	1.15	0.57	1.53	0.22	1.6
40	2415		2740	2490	2615		2750+	59.0	23.5	11.5	1.28	1.33	1.11	0.17	2.0
40	2450		2460	2750+	2750+		2750+	9.60*	3.60*	85.0*	0.20	0.54	0.07	0.10	0.6
30	2050		2150	2580	2650		2665	26.5	10.8	58.0*	0.53	1.25	0.46	0.12	1.5
70	2235		2715	2400	2565		2750+	56.5	21.9	13.1	1.18	1.81	0.98	0.23	3.3
00	2415		2440	2750+	2750+		2750+	9.60*	3.10*	84.0*	0.20	0.47	0.07	0.09	0.9
95	2440		2715	2515	2605		2750+	53.5	23.0	16.4	1.08	1.52	1.24	0.31	2.8

IDT - Initial Deformation Temperature
ST,S - Softening Temperature, Spherical
ST,H - Softening Temperature, Hemispherical
FT - Fluid Temperature

* Extrapolated Values

Table A21

SCREEN ANALYSIS

Coal **Identification** Lower Kittanning Seam, Westmoreland County, Pa.

BCR Sample No. 2860

Raw Run-of-mine Coal Crushed to 3/8 Inch x 0

Screen Size		Weight Percent	Cumulative
Plus 1/4"		7.4	7.4
1/4" x 6 M		21.8	29.2
6 M x 12 M		22.0	51.2
Minus 12 M		48.8	100.0
	Total	100.0	

Zones A, B, and C from 3/8 Inch x 0 Run (8-3-71) Crushed to 30 Mesh x 0

Screen Size		Weight Percent	Cumulative
Plus 30 M		4.0	4.0
30 M x 50 M		24.4	28.4
50 M x 100 M		24.8	53.2
Minus 100 M		46.8	100.0
	Total	100.0	

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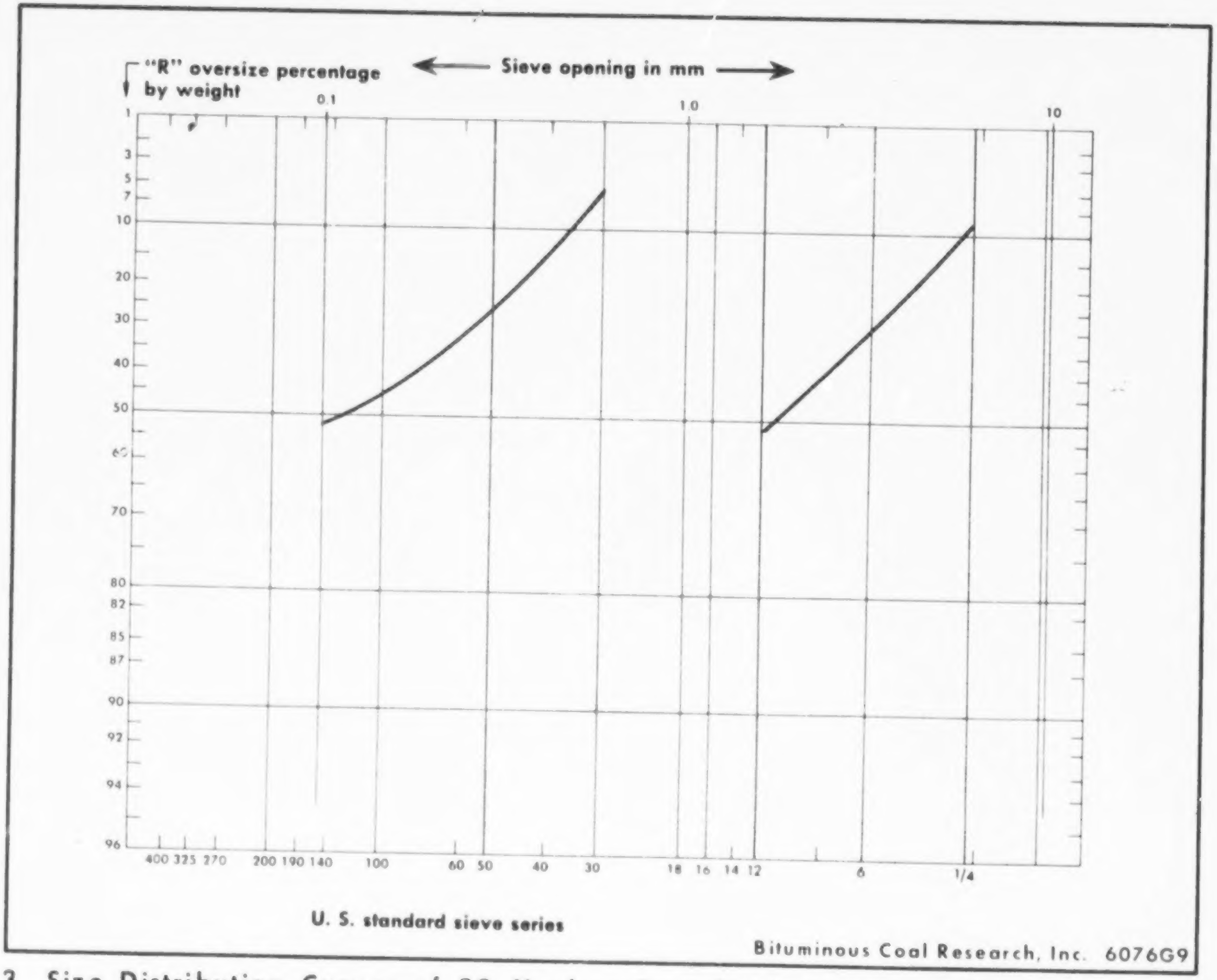


Bituminous Coal Research, Inc. 6076G9

Figure A-3. Size Distribution Curves of 30 Mesh × 0 and 3/8 Inch × 0 Concentrating Table Feed for Lower Kittanning Seam, Westmoreland County, Pennsylvania, BCR Sample No. 2860

Table A22

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table Tests--3/8 Inch x 0 Rough Cleaning and Pyrite Precleaning

Coal Identification Lower Kittanning Seam, Westmoreland County, Pennsylvania

Raw Run-of-mine Coal Crushed to 3/8 inch x 0

BCR Sample No. 2860

Table Products	Product Weight Percent	Float and Sink Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
			Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	45.9		0.50	8.26	1.90	
Zone B	17.5		0.35	8.10	2.09	
Zone C						
Float at 1.60	4.1	48.5	0.28	11.0	3.00	
1.60 by 1.90	1.7	20.0	0.98	31.2	8.42	
Sink at 1.90	2.6	31.5	0.72	62.8	9.46	
Composite	8.4	100.0		31.4	6.12	
Zone D						
Float at 1.90	0.5	4.6	0.35	27.8	6.87	
1.90 by 2.95	11.4	94.1	0.52	78.6	5.07	
Sink at 2.95	0.2	1.3	0.38	67.0	29.1	
Composite	12.1	100.0		76.1	5.47	
Zone E						
Float at 2.95	12.3	76.2	0.74	81.0	2.18	
Sink at 2.95	3.8	23.8	0.48	65.4	36.4	
Composite	16.1	100.0		77.3	12.6	
Composite of Zones A, B, C	71.8			10.9	2.44	
Composite of 1.60 Float Fractions	67.5			8.39	2.02	
Composite of 2.95 Sink Fractions	4.0			65.5	36.0	
Composite of Table Products	100.0			29.5	4.44	
Analysis of Feed to Table			0.40	26.4	4.18	

Run Date: 8-3-71

Table A23

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table Tests--30 Mesh x 0 Deep Cleaning

Coal Identification Lower Kittanning Seam, Westmoreland County, Pennsylvania

Zones A, B, and C, 3/8 Inch x 0 Run (8-3-71) Crushed to 30 Mesh x 0

BCR Sample No. 2860

Table Products	Product Weight Percent	Float and Sink Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
			Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	83.3		0.50	7.46	1.88	
Zone B	10.7		0.42	8.06	1.98	
Zone C						
Float at 1.60	0.9	90.7	0.58	11.5	2.16	
Sink at 1.60	0.1	9.3	0.46	54.5	10.3	
Composite	1.0	100.0		15.5	2.92	
Zone D						
Float at 1.60	1.1	22.9	0.55	20.4	3.14	
1.60 by 2.95	3.3	72.2	0.52	59.2	7.10	
Sink at 2.95	0.2	4.9	0.34	60.2	39.0	
Composite	4.6	100.0		50.4	7.76	
Zone E						
Float at 2.95	0.1	23.1	0.60	72.8	11.8	
Sink at 2.95	0.3	76.9	0.34	62.3	41.4	
Composite	0.4	100.0		64.7	34.6	
Composite of Zones A, B, C	95.0			7.61	1.90	
Composite of 1.60 Float Fractions	95.9			7.69	1.91	
Composite of 2.95 Sink Fractions	0.3			60.9	39.8	
Composite of Table Products	100.0			9.82	2.33	
Analysis of Feed to Table			0.44	10.2	2.32	

Run Date: 8-10-71

Table A24

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table Tests--Effects of Two-stage Cleaning

Coal Identification Lower Kittanning Seam, Westmoreland County, Pennsylvania

Composite of 3/8 Inch x 0 Run (8-3-71) and 30 Mesh x 0 Run (8-10-71)

BCR Sample No. 2860

Table Products	Product Weight Percent	Float and Sink Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
			Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	59.8			7.46	1.88	
Zone B	7.7			8.06	1.98	
Zone C						
Float at 1.60	0.6	90.7		11.5	2.16	
Sink at 1.60	0.1	9.3		54.5	10.3	
Composite	0.7	100.0		15.5	2.92	
Zone D						
Float at 2.95	14.3	92.9		70.5	5.37	
Sink at 2.95	1.1	7.1		65.8	30.9	
Composite	15.4	100.0		70.2	7.18	
Zone E						
Float at 2.95	12.4	75.6		80.9	5.23	
Sink at 2.95	4.0	24.4		65.2	36.7	
Composite	16.4	100.0		77.1	12.9	
Composite of Zones A, B, C	68.2			7.61	1.90	
Composite of 1.60 Float Fractions	68.1			7.56	1.89	
Composite of 2.95 Sink Fractions	5.1			65.3	35.4	
Composite of Table Products	100.0			28.6	4.52	
Analysis of Feed to Table			0.40	26.4	4.18	

Table A25

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table No. 15-S Tests - Pyrite Beneficiation

Coal Identification Lower Kittanning Seam, Westmoreland County, Pennsylvania
Zone E, 3/8 Inch x 0 Run (8-3-71) Crushed to 30 Mesh x 0

BCR Sample No. 2860

Table Products	Product, Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
		Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	9.1	0.40	67.4	11.8	
Zone B	9.1	0.38	68.7	10.8	
Zone C	5.0	0.43	69.4	9.86	
Zone D	68.5	0.38	80.9	10.5	
Zone E	8.3	0.14	68.6	37.4	
Composite of Table Products	100.0		77.0	12.8	
Analysis of Feed to Table			77.3	12.6	

Run Date: 8-11-71

Table A26

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table No. 15-S Tests - Pyrite Beneficiation

Coal Identification Lower Kittanning Seam, Westmoreland County, Pennsylvania

Zone D, 30 Mesh x 0 Run (8-11-71) Crushed to 60 Mesh x 0

BCR Sample No. 2860

Table Products	Product, Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
		Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	7.3	0.48	80.6	7.22	
Zone B	17.2	0.40	80.8	7.00	
Zone C	20.5	0.28	80.8	6.44	
Zone D	45.3	0.30	82.2	6.98	
Zone E	9.7	0.24	80.1	19.8	
Composite of Table Products	100.0		81.4	8.13	
Analysis of Feed to Table		.40	82.1	7.74	

Run Date: 8-12-71

Table A27

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Pyrite Beneficiation - Effects of Two-stage Cleaning

Coal Identification Lower Kittanning Seam, Westmoreland County, Pennsylvania

BCR Sample No. 2860

Pyrite Precleaning

Concentrating Table No. 14 Test Run Date 8-3-71
Feed to Concentrating Table: Raw Run-of-mine Coal Crushed to 3/8 Inch x 0

	Product, Weight %	Chemical Analysis, Dry Basis, Weight % Ash	Total Sulfur
Analysis of Feed to Table		26.4	4.18
Zone E (Pyrite Zone)	16.1	77.3	12.6

Pyrite Cleaning

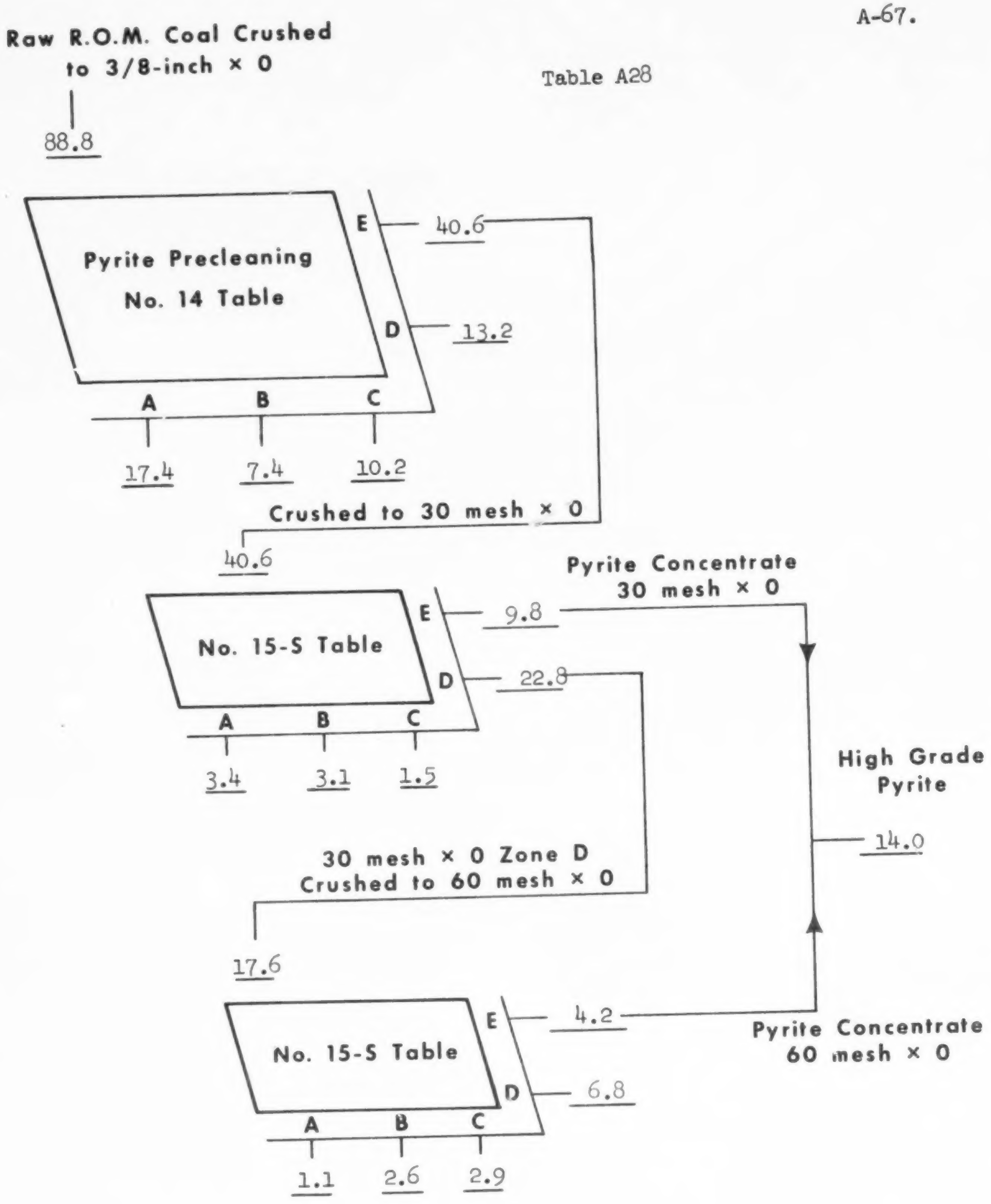
Concentrating Table No. 15-S Test Run Date 8-11-71
Feed to Concentrating Table: Zone E, 3/8 Inch x 0 Run (8-3-71) Crushed to 30 Mesh x 0

	Product, Weight %	Chemical Analysis, Dry Basis, Weight % Ash	Total Sulfur
Analysis of Feed to Table		77.3	12.6
Zone E (Pyrite Zone)	8.3	68.6	37.4

Concentrating Table No. 15-S Test Run Date 8-12-71
Feed to Concentrating Table: Zone D, 30 Mesh x 0 Run (8-11-71) Crushed to 60 Mesh x 0

	Product, Weight %	Chemical Analysis, Dry Basis, Weight % Ash	Total Sulfur
Analysis of Feed to Table		82.1	7.74
Zone E (Pyrite Zone)	9.7	80.1	19.8
Two Stage Pyrite Product	2.4	73.9	29.3

Table A28


Raw R.O.M. Coal Crushed to 3/8-inch × 0
88.8
Pyrite Precleaning No. 14 Table
E
40.6
D
13.2
A
B
C
17.4
7.4
10.2
Crushed to 30 mesh × 0
40.6
Pyrite Concentrate 30 mesh × 0
No. 15-S Table
E
9.8
D
22.8
A
B
C
3.4
3.1
1.5
High Grade Pyrite
14.0
30 mesh × 0 Zone D Crushed to 60 mesh × 0
17.6
No. 15-S Table
E
4.2
Pyrite Concentrate 60 mesh × 0
D
6.8
A
B
C
1.1
2.6
2.9

Flowsheet for Pyrite Benefication Tests

Lower Kittanning Seam, Westmoreland County, Pennsylvania
BCR Sample No. 2860

Pounds of Total Sulfur/Ton of
Run-of-mine Coal

Table A29

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Flowsheet Data for Pyrite Beneficiation Tests

Coal Identification Lower Kittanning Seam, Westmoreland County, Pennsylvania

BCR Sample No. 2860

Fraction	Weight Percent		Chemical Analysis, Dry Basis Weight Percent	
			Ash	Total Sulfur
Table No. 14				
Zone A	45.9		8.26	1.90
Zone B	17.5		8.10	2.09
Zone C	8.4		31.4	6.12
Zone D	12.1		76.1	5.47
Zone E		16.1	77.3	12.6
Table No. 15-S (30 Mesh x 0)				
Zone A	1.5		67.4	11.8
Zone B	1.5		68.7	10.8
Zone C	0.8		69.4	9.86
Zone D		11.0	80.9	10.5
Zone E	1.3		68.6	37.4
Table No. 15-S (60 Mesh x 0)				
Zone A	0.8		80.6	7.22
Zone B	1.9		80.8	7.00
Zone C	2.2		80.8	6.44
Zone D	5.0		82.2	6.98
Zone E	1.1		80.1	19.8
Composite of Fractions	100.0		29.5	4.22
Analysis of Feed Coal			26.4	4.18

Table A30

Evaluation of Coal Cleaning Processes and Tech
for Removing Pyritic Sulfur from Fine Coa

Concentrating Table Tests--3/8 Inch x 0 Rough Cl

Ash Characteristics

Coal Identification Lower Kittanning Seam, Westmoreland County, Penn

Raw Run-of-mine Coal Crushed to 3/8 Inch x 0

B

Table Products	Product Weight Percent	Float and Sink Weight %	Chemical Analysis, Dry Basis, Weight Percent							Reducing Atmosph		
			Moisture	Ash	Total Sulfur	Sulfate Sulfur	Pyritic Sulfur	Organic Sulfur	Btu/lb	IDT	ST,S	ST,H
Zone A	45.9		0.50	8.26	1.90	0.01	1.14	0.75	14,428	2160	2495	
Zone B	17.5		0.35	8.10	2.09	0.02	1.35	0.72	14,408	2120	2435	
Zone C			0.30	31.2	6.24	0.02	5.74	0.48	10,138	2100	2420	
1.60 Float	4.1	48.5	0.28	11.0	3.00	-	2.44	0.56	13,776			
1.60 by 1.90	1.7	20.0	0.98	31.2	8.42	0.02	8.00	0.40	9,912			
1.90 Sink	2.6	31.5	0.72	62.8	9.46	0.02	9.28	0.16	4,186			
Composite	8.4	100.0		31.4	6.12	0.01	5.80	0.40	9,982			
Zone D			0.55	77.1	5.31	0.02	5.15	0.14	2,337	2565	2735	
1.90 Float	0.5	4.6	0.35	27.8	6.87	0.02	6.43	0.42	10,604			
1.90 by 2.95	11.4	94.1	0.52	78.6	5.07	0.01	5.00	0.06	1,944			
2.95 Sink	0.2	1.3	0.38	67.0	29.1	0.10	28.9	0.10	3,284			
Composite	12.1	100.0		76.1	5.47	0.01	5.38	0.08	2,360			
Zone E			0.48	77.3	12.8	0.04	12.6	0.15	2,008	2060	2180	
2.95 Float	12.3	76.2	0.74	81.0	5.18	0.02	5.08	0.08	1,666	2460	2690	
2.95 Sink	3.8	23.8	0.48	65.4	36.4	0.21	36.0	0.20	3,428	2070	2120	
Composite	16.1	100.0		77.3	12.6	0.07	12.4	0.11	2,085			
Composite of Table Products	100.0											
Analysis of Feed to Table			0.40	26.4	4.18	0.02	3.64	0.52	11,198	2140	2460	

Run Date: 8-3-71

IDT - Ini
ST,S - Sof
ST,H - Sof
FT - Flu

.e A30

rocesses and Techniques
ılfur from Fine Coal

/8 Inch x 0 Rough Cleaning

eristics

oreland County, Pennsylvania

to 3/8 Inch x 0

BCR Sample No. 2860

Ash Fusibility								Ash Spectrography							
Reducing Atmosphere				Oxidizing Atmosphere											
IDT	ST,S	ST,H	FT	IDT	ST,S	ST,H	FT	SiO_2	Al_2O_3	Fe_2O_3	MgO	CaO	TiO_2	Na_2O	K_2O
2160	2495		2685	2550	2645		2750+	46.0	26.5	20.0	0.44	2.43	1.57	0.36	1.7
2120	2435		2600	2560	2640		2750	45.0	25.9	21.8	0.40	2.22	1.44	0.34	1.3
2100	2420		2620	2555	2625		2740	44.0	26.1	25.0	0.38	0.71	1.25	0.26	1.7
								38.5	26.6	28.5	0.20	1.13	1.23	0.23	1.2
								38.5	23.5	35.0	0.25	0.41	0.90	0.22	1.3
								49.5	25.0	20.0	0.28	0.59	1.35	0.24	1.8
2565	2735		2750+	2750+	2750+		2750+	58.0	26.5	10.6	0.50	0.38	1.73	0.30	2.0
								40.5	25.5	30.7	0.28	0.46	1.01	0.24	1.6
								57.0	28.5	9.10	0.40	0.35	1.65	0.23	1.6
								24.8	11.6	60.0*	0.31	0.74	0.49	0.18	1.6
2060	2180		2560	2540	2600		2720	49.0	22.5	24.0	0.50	0.48	1.25	0.28	2.5
2460	2690		2750+	2750+	2750+		2750+	55.5	25.7	9.20	0.52	0.54	1.55	0.22	1.3
2070	2120		2320	2750+	2750+		2750+	14.0	7.50	75.0*	0.23	0.47	0.25	0.11	1.0
2140	2460		2700	2570	2650		2750+	50.0	24.6	18.7	0.44	0.84	1.50	0.28	1.7

IDT - Initial Deformation Temperature
ST,S - Softening Temperature, Spherical
ST,H - Softening Temperature, Hemispherical
FT - Fluid Temperature

* Extrapolated Values

Table A31

SCREEN ANALYSIS

Coal Identification Lower Freeport Seam, Indiana County, Pennsylvania

BCR Sample No. 2881

Raw Run-of-mine Coal Crushed to 3/8 Inch x 0

Screen Size	Weight Percent	Cumulative
Plus 1/4"	14.8	14.8
1/4" x 6 M	30.7	45.5
6 M x 12 M	20.7	66.2
Minus 12 M	33.8	100.0
Total	100.0	

Zones A, B, and C from 3/8 Inch x 0 Run (8-19-71) Crushed to 30 Mesh x 0

Screen Size	Weight Percent	Cumulative
Plus 30 M	6.7	6.7
30 M x 50 M	24.4	31.1
50 M x 100 M	22.4	53.5
Minus 100 M	46.5	100.0
Total	100.0	

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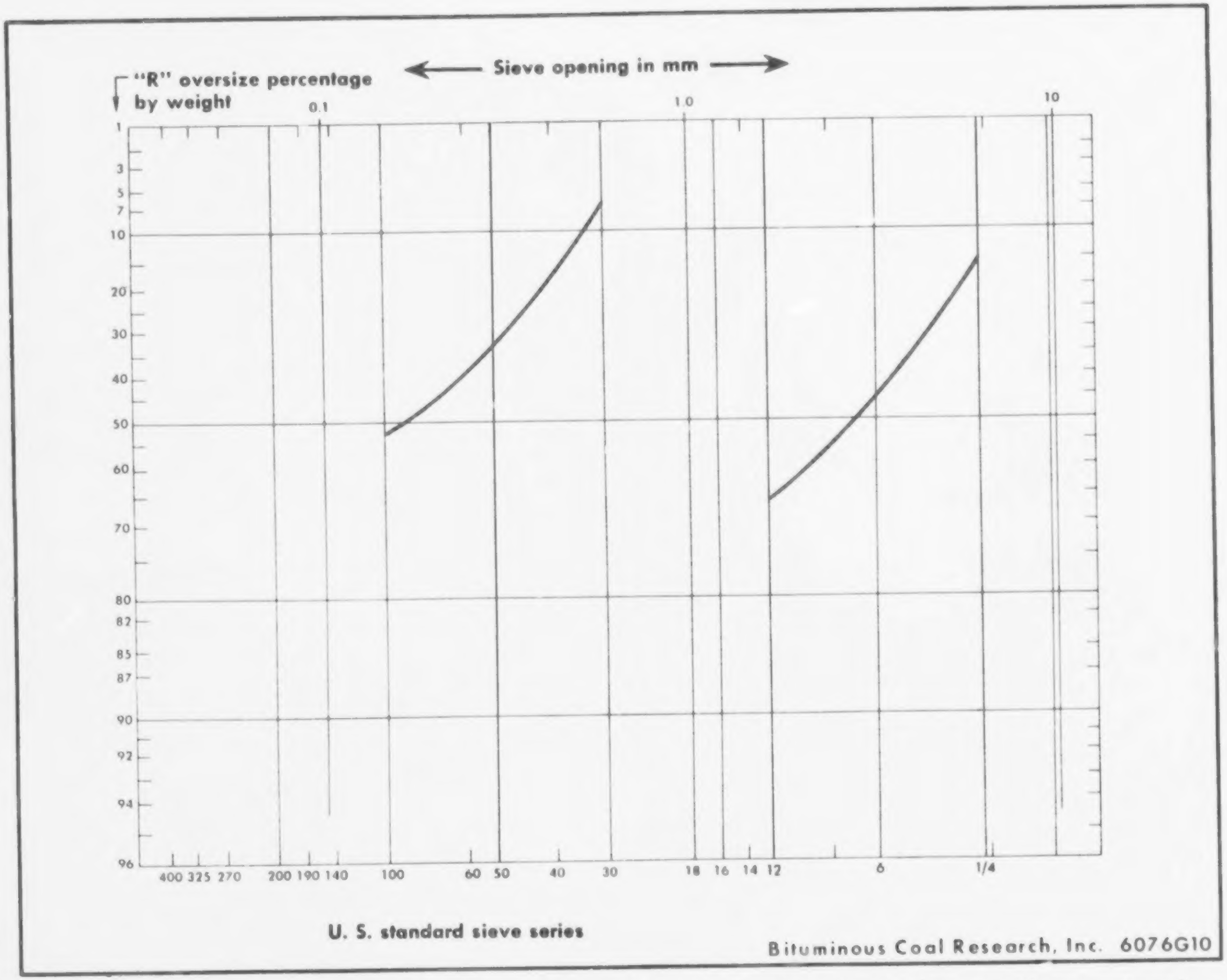


Bituminous Coal Research, Inc. 6076G10

Figure A-4. Size Distribution Curves of 30 Mesh × 0 and 3/8 Inch × 0 Concentrating Table Feed for Lower Freeport Seam, Indiana County, Pennsylvania, BCR Sample No. 2881

Table A32

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table Tests--3/8 Inch x 0 Rough Cleaning & Pyrite Precleaning

Coal Identification Lower Freeport Seam, Indiana County, Pennsylvania

Raw Run-of-mine Coal Crushed to 3/8 Inch x 0

BCR Sample No. 2881

Table Products	Product Weight Percent	Float and Sink Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
			Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	46.6		0.45	8.21	1.28	
Zone B	18.2		0.46	8.35	1.36	
Zone C						
Float at 1.60	9.8	49.8	0.72	10.8	1.44	
1.60 by 1.90	5.5	27.7	0.60	46.1	1.94	
Sink at 1.90	4.4	22.5	0.74	66.4	2.88	
Composite	19.7	100.0		33.1	1.90	
Zone D						
Float at 1.90	1.4	12.3	0.60	37.6	2.06	
1.90 by 2.95	9.2	84.6	0.78	80.6	2.62	
Sink at 2.95	0.3	3.1	0.36	62.4	36.8	
Composite	10.9	100.0		74.7	3.61	
Zone E						
Float at 2.95	3.9	84.2	0.68	82.2	3.14	
Sink at 2.95	0.7	15.8	0.34	61.8	40.8	
Composite	4.6	100.0		79.0	9.09	
Composite of Zones A, B, C	84.5			14.0	1.44	
Composite of 1.60 Float Fractions	74.6			8.58	1.32	
Composite of 2.95 Sink Fractions	1.0			62.0	39.6	
Composite of Table Products	100.0			23.6	2.03	
Analysis of Feed to Table			0.50	19.9	1.86	

Run Date: 8-19-71

Table A33

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table Tests--30 Mesh x 0 Deep Cleaning

Coal Identification Lower Freeport Seam, Indiana County, Pennsylvania
Zones A, B, and C, 3/8 Inch x 0 Run (8-19-71) Crushed to 30 Mesh x 0

BCR Sample No. 2881

Table Products	Product Weight Percent	Float and Sink Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
			Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	80.2		0.58	10.2	1.24	
Zone B	13.1		0.62	9.50	1.08	
Zone C						
Float at 1.60	0.56	93.9	0.56	9.80	1.22	
Sink at 1.60	0.04	6.1	0.50	50.3	5.13	
Composite	0.6	100.0		12.3	1.46	
Zone D						
Float at 1.60	1.05	18.4	0.66	21.6	1.35	
1.60 by 2.95	4.61	80.9	0.78	59.2	1.52	
Sink at 2.95	0.04	0.7	0.41	61.1	39.8	
Composite	5.7	100.0		51.5	1.76	
Zone E						
Float at 2.95	0.2	50.7	0.60	79.0	6.96	
Sink at 2.95	0.2	49.3	0.30	62.4	41.6	
Composite	0.4	100.0		70.8	24.0	
Composite of Zones A, B, C	93.9			10.1	1.22	
Composite of 1.60 Float Fractions	94.9			10.2	1.22	
Composite of 2.95 Sink Fractions	0.24			62.2	41.3	
Composite of Table Products	100.0			12.7	1.34	
Analysis of Feed to Table			0.44	13.2	1.46	

Run Date: 8-31-71

Table A34

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table Tests-- Effects of Two-stage Cleaning

Coal Identification Lower Freeport Seam, Indiana County, Pennsylvania

Composite of 3/8 Inch x 0 Run (8-19-71) and 30 Mesh x 0 Run (8-31-71)

BCR Sample No. 2881

Table Products	Product Weight Percent	Float and Sink Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
			Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	67.8			10.2	1.24	
Zone B	11.1			9.50	1.08	
Zone C						
Float at 1.60	0.47	93.9		9.80	1.22	
Sink at 1.60	0.03	6.1		50.3	5.13	
Composite	0.5	100.0		12.3	1.46	
Zone D						
Float at 2.95	15.37	97.9		67.8	2.22	
Sink at 2.95	0.33	2.1		62.3	37.1	
Composite	15.7	100.0		67.7	2.95	
Zone E						
Float at 2.95	4.05	82.7		82.1	3.28	
Sink at 2.95	0.85	17.3		61.9	40.9	
Composite	4.9	100.0		78.6	9.79	
Composite of Zones A, B, C	79.4			10.1	1.22	
Composite of 1.60 Float Fractions	79.37			10.1	1.22	
Composite of 2.95 Sink Fractions	1.18			62.0	39.8	
Composite of Table Products	100.0			22.5	1.91	
Analysis of Feed to Table			0.50	19.9	1.86	

Table A35

Evaluation of Coal Cleaning Processes and Techniques
for Removing Pyritic Sulfur from Fine Coal

Concentrating Table No. 15-S Tests - Pyrite Beneficiation

Coal Identification Lower Freeport Seam, Indiana County, Pennsylvania

Zone E, 3/8 Inch x 0 Run (8-19-71) Crushed to 30 Mesh x 0

BCR Sample No. 2881

Table Products	Product, Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
		Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	7.5	0.62	72.4	6.00	
Zone B	8.0	0.63	73.0	5.78	
Zone C	4.5	0.62	73.4	4.88	
Zone D	74.4	0.66	81.8	8.26	
Zone E	5.6	0.20	67.1	43.8	
Composite of Table Products	100.0		79.2	9.73	
Analysis of Feed to Table		0.78	80.8	10.8	

Run Date: 9-3-71

Table A36

Evaluation of Coal Cleaning Processes and Techniques
for Removing Pyritic Sulfur from Fine Coal

Concentrating Table No. 15-S Tests - Pyrite Beneficiation

Coal Identification Lower Freeport Seam, Indiana County, Pennsylvania

Zone D, 30 Mesh x 0 Run (9-3-71) Crushed to 60 Mesh x 0

BCR Sample No. 2881

Table Products	Product, Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
		Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	3.4	0.64	81.3	5.01	
Zone B	23.6	0.55	82.0	4.42	
Zone C	21.1	0.59	82.4	3.46	
Zone D	45.5	0.54	85.0	4.52	
Zone E	6.4	0.24	73.4	31.5	
Composite of Table Products	100.0		82.9	6.02	
Analysis of Feed to Table		0.62	83.0	6.30	

Run Date: 9-7-71

Table A37

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Pyrite Beneficiation - Effects of Two-stage Cleaning

Coal Identification Lower Freeport Seam, Indiana County, Pennsylvania

BCR Sample No. 2881

Pyrite Precleaning

Concentrating Table No. 14 Test Run Date 8-19-71
Feed to Concentrating Table: Raw Run-of-mine Coal Crushed to 3/8 Inch x 0

	Product, Weight %	Chemical Analysis, Dry Basis, Weight %	
		Ash	Total Sulfur
Analysis of Feed to Table		19.9	1.86
Zone E (Pyrite Zone)	4.6	79.0	9.09

Pyrite Cleaning

Concentrating Table No. 15-S Test Run Date 9-3-71
Feed to Concentrating Table: Zone E, 3/8 Inch x 0 Run (8-19-71) Crushed to 30 Mesh x 0

	Product, Weight %	Chemical Analysis, Dry Basis, Weight %	
		Ash	Total Sulfur
Analysis of Feed to Table		80.8	10.8
Zone E (Pyrite Zone)	5.6	67.1	43.0

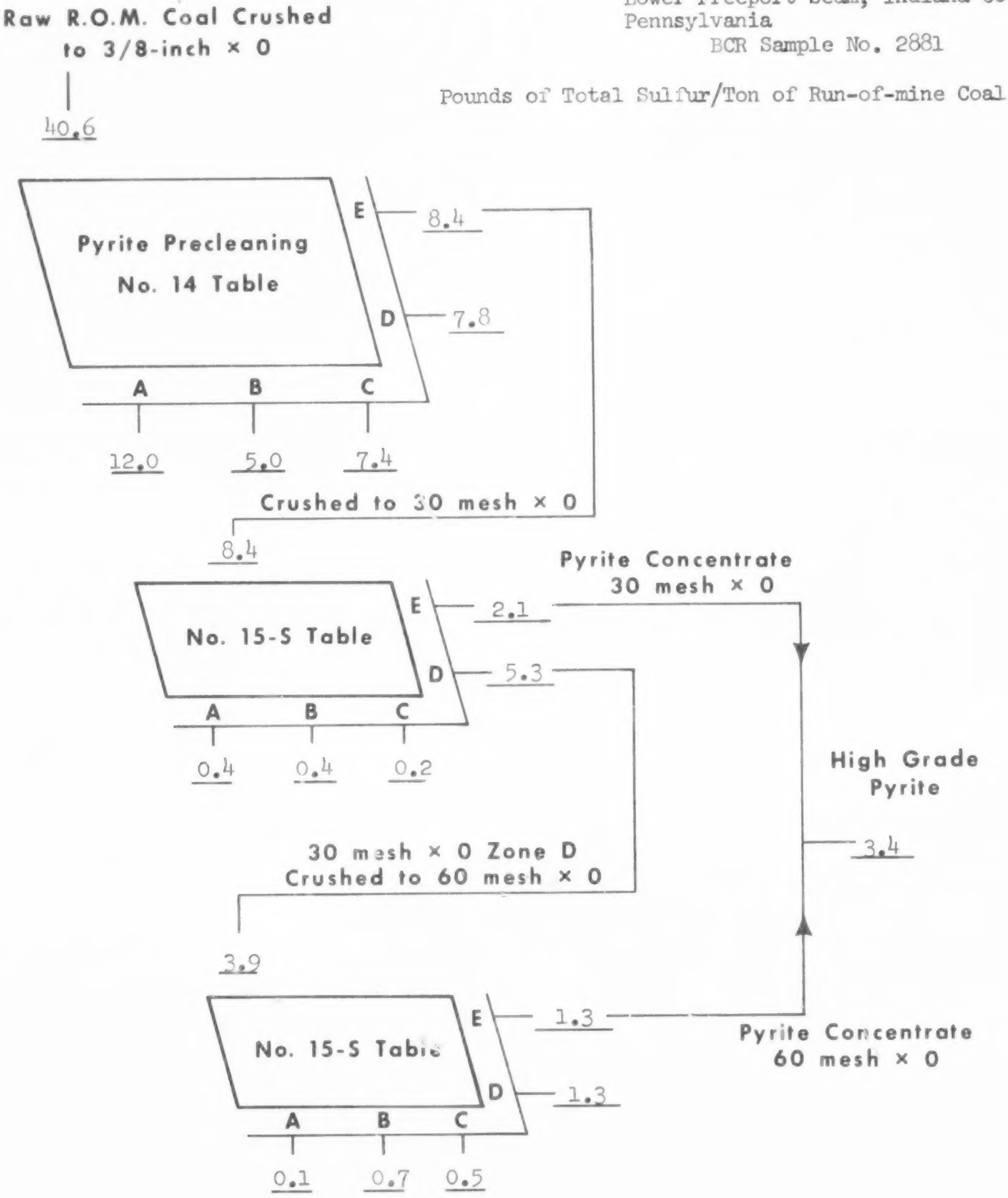
Concentrating Table No. 15-S Test Run Date 9-7-71
Feed to Concentrating Table: Zone D, 30 Mesh x 0 Run (9-3-71) Crushed to 60 Mesh x 0

	Product, Weight %	Chemical Analysis, Dry Basis, Weight %	
		Ash	Total Sulfur
Analysis of Feed to Table		83.0	6.30
Zone E (Pyrite Zone)	6.4	73.4	31.5
Two Stage Pyrite Product	0.5	69.6	38.9

Table A38

Lower Freeport Seam, Indiana County,
Pennsylvania
BCR Sample No. 2881

Pounds of Total Sulfur/Ton of Run-of-mine Coal


Raw R.O.M. Coal Crushed to 3/8-inch × 0
40.6
Pyrite Precleaning No. 14 Table
E
8.4
D
7.8
A
B
C
12.0
5.0
7.4
Crushed to 30 mesh × 0
8.4
No. 15-S Table
Pyrite Concentrate 30 mesh × 0
E
2.1
D
5.3
A
B
C
0.4
0.4
0.2
High Grade Pyrite
3.4
30 mesh × 0 Zone D Crushed to 60 mesh × 0
3.9
No. 15-S Table
E
1.3
Pyrite Concentrate 60 mesh × 0
D
1.3
A
B
C
0.1
0.7
0.5

Flowsheet for Pyrite Benefication Tests

Table A39

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Flowsheet Data for Pyrite Beneficiation Tests

Coal Identification Lower Freeport Seam, Indiana County, Pennsylvania

BCR Sample No. 2881

Fraction	Weight Percent		Chemical Analysis, Dry Basis Weight Percent	
			Ash	Total Sulfur
Table No. 14				
Zone A	46.6		8.21	1.28
Zone B	18.2		8.35	1.36
Zone C	19.7		33.1	1.90
Zone D	10.9		74.7	3.61
Zone E		4.6	79.0	9.09
Table No. 15-S (30 Mesh x 0)				
Zone A	0.3		72.4	6.00
Zone B	0.4		73.0	5.78
Zone C	0.2		73.4	4.88
Zone D		3.4	81.8	8.26
Zone E	0.3		67.1	43.8
Table No. 15-S (60 Mesh x 0)				
Zone A	0.1		81.3	5.01
Zone B	0.8		82.0	4.42
Zone C	0.7		82.4	3.46
Zone D	1.6		85.0	4.52
Zone E	0.2		73.4	31.5
Composite of Fractions			23.7	1.99
Analysis of Feed Coal			19.9	1.86

Table A40

Evaluation of Coal Cleaning Processes an
for Removing Pyritic Sulfur from Fi

Concentrating Table Tests--3/8 Inch x 0 Ro

Ash Characteristics

Coal Identification Lower Freeport Seam, Indiana County, Penn

Raw Run-of-mine Coal Crushed to 3/8 Inch

Table Products	Product Weight Percent	Float and Sink Weight %	Chemical Analysis, Dry Basis, Weight Percent							Reducing	
			Moisture	Ash	Total Sulfur	Sulfate Sulfur	Pyritic Sulfur	Organic Sulfur	Btu/lb	IDT	ST,S
Zone A	46.6		0.45	8.21	1.28	-	0.74	0.54	14,231	2520	2635
Zone B	18.2		0.46	8.35	1.36	-	0.78	0.58	14,230	2550	2680
Zone C			0.40	34.0	2.00	-	1.60	0.40	9,948	2600	2720
1.60 Float	9.8	49.8	0.72	10.8	1.44	-	0.96	0.48	13,824	2635	2740
1.60 by 1.90	5.5	27.7	0.60	46.1	1.94	-	1.68	0.26	7,785	2660	2750
1.90 Sink	4.4	22.5	0.74	66.4	2.88	-	2.76	0.12	4,388	2580	2665
Composite	19.7	100.0		33.1	1.90	-	1.56	0.34	10,028		
Zone D			0.61	74.8	2.85	0.01	2.72	0.12	2,984	2580	2640
1.90 Float	1.4	12.3	0.60	37.6	2.06	-	1.76	0.30	9,271	2695	2750
1.90 by 2.95	9.2	84.6	0.78	80.6	2.62	-	2.56	0.06	1,997	2540	2690
2.95 Sink	0.3	3.1	0.36	62.4	36.8	0.20	36.4	0.18	3,769	2070	2340
Composite	10.9	100.0		74.7	3.61	0.01	3.51	0.09	2,947		
Zone E			0.64	79.3	9.26	0.06	9.07	0.12	2,054	2160	2220
2.95 Float	3.9	84.2	0.68	82.2	3.14	-	3.06	0.08	1,726	2385	2605
2.95 Sink	0.7	15.8	0.34	61.8	40.8	0.23	40.2	0.38	4,392	2380	2430
Composite	4.6	100.0		79.0	9.09	0.03	8.93	0.13	2,147		
Composite of Table Products	100.0			23.6	2.03	0.00	1.59	0.44	11,617		
Analysis of Feed to Table			0.50	19.9	1.86	0.02	1.42	0.42	12,294	2500	2630

Run Date: 8-19-71

IDT
ST,S
ST,H
FT

ble A40

ning Processes and Techniques
ic Sulfur from Fine Coal

--3/8 Inch x 0 Rough Cleaning

acteristics

diana County, Pennsylvania

shed to 3/8 Inch x 0

BCR Sample No. 2881

	Ash Fusibility								Ash Spectrography							
	Reducing Atmosphere				Oxidizing Atmosphere											
/lb	IDT	ST,S	ST,H	FT	IDT	ST,S	ST,H	FT	SiO_2	Al_2O_3	Fe_2O_3	MgO	CaO	TiO_2	Na_2O	K_2O
231	2520	2635		2750+	2720	2750+		2750+	47.5	31.0	13.9	0.58	1.52	1.40	0.30	3.0
230	2550	2680		2750+	2750+	2750+		2750+	48.5	31.5	12.4	0.62	1.43	1.42	0.30	2.3
948	2600	2720		2750+	2750+	2750+		2750+	60.0	26.5	7.40	0.83	0.50	1.64	0.24	2.3
824	2635	2740		2750+	2750+	2750+		2750+	49.0	31.0	12.7	0.60	0.96	1.43	0.32	2.8
785	2660	2750+		2750+	2750+	2750+		2750+	62.0	25.3	6.00	0.67	0.27	1.57	0.25	3.0
388	2560	2665		2750+	2720+	2750+		2750+	63.0	23.5	7.00	0.86	0.33	1.53	0.25	2.5
028																
984	2580	2640		2750+	2750+	2750+		2750+	60.0	24.5	6.90	1.04	0.50	1.43	0.25	2.7
271	2695	2750+		2750+	2750+	2750+		2750+	61.0	26.5	7.20	0.74	0.36	1.40	0.26	2.8
997	2540	2690		2750+	2745+	2750+		2750+	64.0	25.3	6.50	1.12	0.42	1.43	0.25	2.7
769	2070	2340		2360	2750+	2750+		2750+	13.5*	6.20*	78.0*	0.38	0.35	0.20	0.08	0.7
47																
54	2160	2220		2440	2540	2600		2680	54.5	22.0	16.9	1.04	0.50	1.14	0.21	2.1
726	2385	2605		2750+	2710	2750+		2750+	63.0	24.0	7.10	1.12	0.40	1.28	0.17	2.1
392	2380	2430		2440	2750+	2750+		2750+	9.40*	4.15*	85.0*	0.24	0.29	0.12	0.06	0.6
147																
617																
94	2500	2630		2750+	2750+	2750+		2750+	55.0	27.6	10.8	0.83	0.80	1.59	0.23	3.2

IDT - Initial Deformation Temperature
ST,S - Softening Temperature, Spherical
ST,H - Softening Temperature, Hemispherical
FT - Fluid Temperature

* Extrapolated Values

Table A41

SCREEN ANALYSIS

Coal Identification Fort Scott Seam, Rogers County, Oklahoma

BCR Sample No. 2889

Raw Run-of-mine Coal Crushed to 3/8 Inch x 0

Screen Size	Weight Percent	Cumulative
Plus 1/4"	12.5	12.5
1/4" x 6 M	27.1	39.6
6 M x 12 M	20.6	60.2
Minus 12 M	39.8	100.0
Total	100.0	

Zones A, B, and C From 3/8 Inch x 0 Run (9-17-71) Crushed to 30 Mesh x 0

Screen Size	Weight Percent	Cumulative
Plus 30 M	10.4	10.4
30 M x 50 M	28.7	39.1
50 M x 100 M	23.0	62.1
Minus 100 M	37.9	100.0
Total	100.0	

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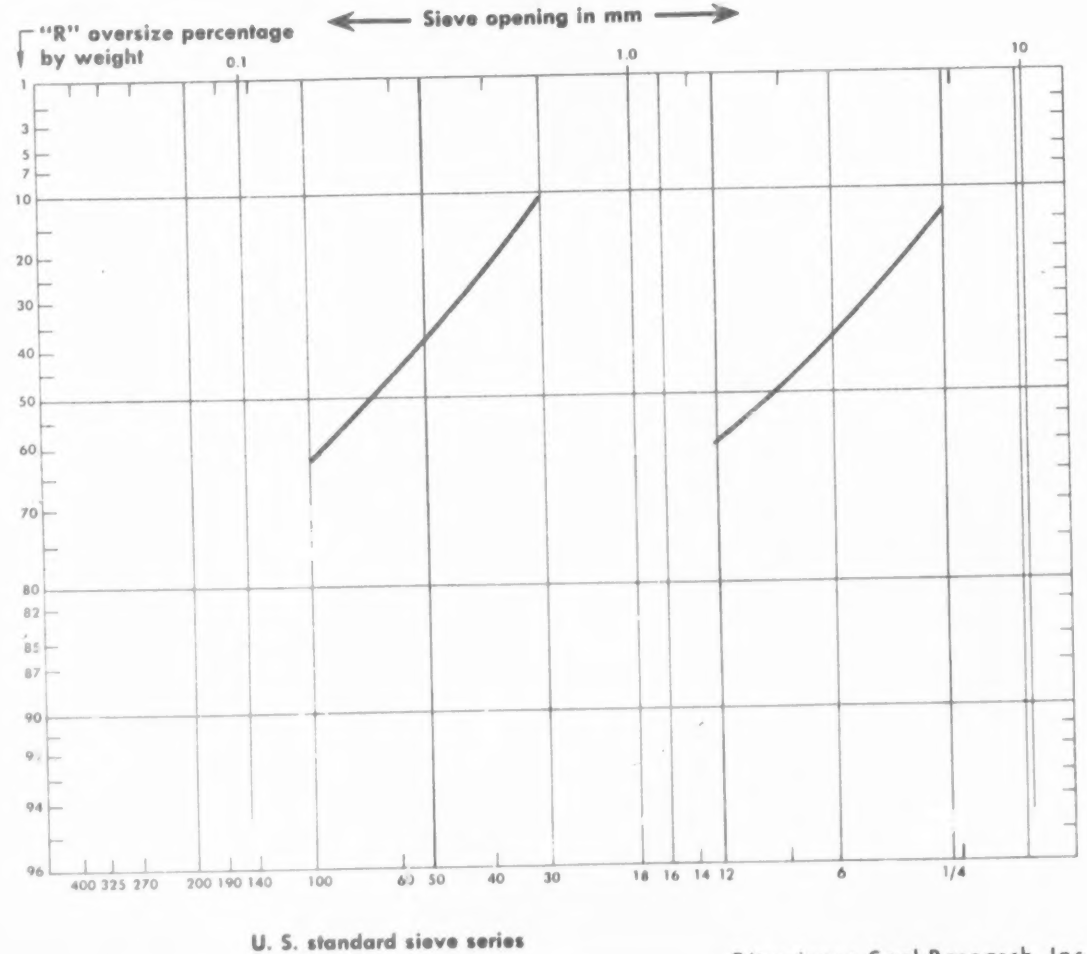

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Figure A-5. Size Distribution Curves of 30 Mesh × 0 and 3/8 Inch × 0 Concentrating Table Feed for Fort Scott Seam, Rogers County, Oklahoma, BCR Sample No. 2889

Table A42

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table Tests--3/8 Inch x 0 Rough Cleaning and Pyrite Precleaning

Coal Identification Fort Scott Seam, Rogers County, Oklahoma

Raw Run-of-mine Coal Crushed to 3/8 Inch x 0

BCR Sample No. 2889

Table Products	Product Weight Percent	Float and Sink Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
			Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	43.0		1.60	6.51	3.44	
Zone B	39.2		1.42	5.12	3.58	
Zone C						
Float at 1.60	7.0	64.6	0.98	8.85	5.30	
1.60 by 1.90	1.3	12.6	1.07	34.7	7.02	
Sink at 1.90	2.5	22.8	0.64	71.4	5.20	
Composite	10.8	100.0		26.4	5.49	
Zone D						
Float at 1.90	0.6	12.0	1.46	15.4	5.12	
1.90 by 2.95	3.7	78.0	0.64	73.6	4.53	
Sink at 2.95	0.5	10.0	0.38	73.5	30.2	
Composite	4.8	100.0		66.6	7.17	
Zone E						
Float at 2.95	1.4	64.5	0.33	67.0	4.37	
Sink at 2.95	0.8	35.5	0.26	73.4	35.2	
Composite	2.2	100.0		69.3	15.3	
Composite of Zones A, B, C	93.0			8.23	3.74	
Composite of 1.60 Float Fractions	89.2			6.08	3.65	
Composite of 2.95 Sink Fractions	1.3			73.4	33.3	
Composite of Table Products	100.0			12.4	4.16	
Analysis of Feed to Table			1.22	13.3	4.21	

Run Date: 9-17-71

Table A43

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table Tests--30 Mesh x 0 Deep Cleaning

Coal Identification Fort Scott Seam, Rogers County, Oklahoma

Zones A, B, and C, 3/8 Inch x 0 Run (9-17-71) Crushed to 30 Mesh x 0

BCR Sample No. 2889

Table Products	Product Weight Percent	Float and Sink Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
			Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	81.1		1.91	5.38	3.56	
Zone B	13.8		1.24	5.08	3.70	
Zone C						
Float at 1.60	0.46	92.6	0.94	5.50	4.48	
Sink at 1.60	0.04	7.4	0.20	60.2	10.1	
Composite	0.5	100.0		9.55	4.90	
Zone D						
Float at 1.60	1.9	43.3	0.92	13.2	8.38	
1.60 by 2.95	2.5	54.7	0.42	58.2	7.54	
Sink at 2.95	0.1	2.0	0.36	68.4	34.0	
Composite	4.5	100.0		38.9	8.43	
Zone E						
Float at 2.95	0.03	27.4	0.10	80.7	2.42	
Sink at 2.95	0.07	72.6	0.15	67.6	42.2	
Composite	0.1	100.0		71.2	31.3	
Composite of Zones A, B, C	95.4			5.36	3.58	
Composite of 1.60 Float Fractions	97.3			5.49	3.68	
Composite of 2.95 Sink Fractions	0.17			68.1	37.4	
Composite of Table Products	100.0			6.93	3.83	
Analysis of Feed to Table			1.09	7.28	3.86	

Run Date: 9-23-71

Table A44

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table Tests--Effects of Two-stage Cleaning

Coal Identification Fort Scott Seam, Rogers County, Oklahoma

Composite of 3/8 Inch x 0 Run (9-17-71) and 30 Mesh x 0 Run (9-23-71)

BCR Sample No. 2889

Table Products	Product Weight Percent	Float and Sink Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
			Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	75.4			5.38	3.56	
Zone B	12.8			5.08	3.70	
Zone C						
Float at 1.60	0.46	92.6		5.50	4.48	
Sink at 1.60	0.04	7.4		60.2	10.1	
Composite	0.5	100.0		9.55	4.90	
Zone D						
Float at 2.95	8.4	93.3		52.4	6.22	
Sink at 2.95	0.6	6.7		72.6	30.8	
Composite	9.0	100.0		53.8	7.87	
Zone E						
Float at 2.95	1.4	60.9		67.3	4.33	
Sink at 2.95	0.9	39.1		72.9	35.8	
Composite	2.3	100.0		69.5	16.6	
Composite of Zones A, B, C	88.7			5.36	3.59	
Composite of 1.60 Float Fractions	88.66			5.34	3.59	
Composite of 2.95 Sink Fractions	1.5			72.8	33.8	
Composite of Table Products	100.0			11.2	4.27	
Analysis of Feed to Table			1.22	13.3	4.21	

Table A45

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table No. 15-S Tests - Pyrite Beneficiation

Coal Identification Fort Scott Seam, Rogers County, Oklahoma

Zone E, 3/8 Inch x 0 Run (9-17-71) Crushed to 30 Mesh x 0

BCR Sample No. 2889

Table Products	Product, Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
		Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	3.5	0.70	67.1	7.96	
Zone B	6.0	0.71	68.5	7.89	
Zone C	6.7	0.66	62.8	7.74	
Zone D	72.0	0.31	73.8	12.2	
Zone E	11.8	0.17	70.0	44.1	
Composite of Table Products	100.0		72.1	15.3	
Analysis of Feed to Table		0.49	72.2	15.5	

Run Date: 9-27-71

Table A46

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table No. 15-S Tests - Pyrite Beneficiation

Coal Identification Fort Scott Seam, Rogers County, Oklahoma

Zone D, 30 Mesh x 0 Run (9-27-71) Crushed to 60 Mesh x 0

BCR Sample No. 2889

Table Products	Product, Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
		Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	4.8	0.39	68.5	9.53	
Zone B	24.6	0.30	69.0	9.71	
Zone C	22.3	0.30	70.7	9.06	
Zone D	42.2	0.14	71.0	6.52	
Zone E	6.1	0.16	73.2	39.8	
Composite of Table Products	100.0		70.5	10.0	
Analysis of Feed to Table		0.26	70.3	12.0	

Run Date: 9-28-71

Table A47

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Pyrite Beneficiation - Effects of Two-stage Cleaning

Coal Identification Fort Scott Seam, Rogers County, Oklahoma

BCR Sample No. 2889

Pyrite Precleaning

Concentrating Table No. 14 Test Run Date 9-17-71

Feed to Concentrating Table: Raw Run-of-mine Coal Crushed to 3/8 Inch x 0

	Product, Weight %	Chemical Analysis, Dry Basis, Weight % Ash	Total Sulfur
Analysis of Feed to Table		13.3	4.21
Zone E (Pyrite Zone)	2.2	69.3	15.3

Pyrite Cleaning

Concentrating Table No. 15-S Test Run Date 9-27-71

Feed to Concentrating Table: ~~Zone~~ Zone E, 3/8 Inch x 0 Run (9-17-71) Crushed to 30 Mesh x 0

	Product, Weight %	Chemical Analysis, Dry Basis, Weight % Ash	Total Sulfur
Analysis of Feed to Table		72.2	15.5
Zone E (Pyrite Zone)	11.8	70.0	44.1

Concentrating Table No. 15-S Test Run Date 9-28-71

Feed to Concentrating Table: Zone D, 30 Mesh x 0 Run (9-27-71) Crushed to 60 Mesh x 0

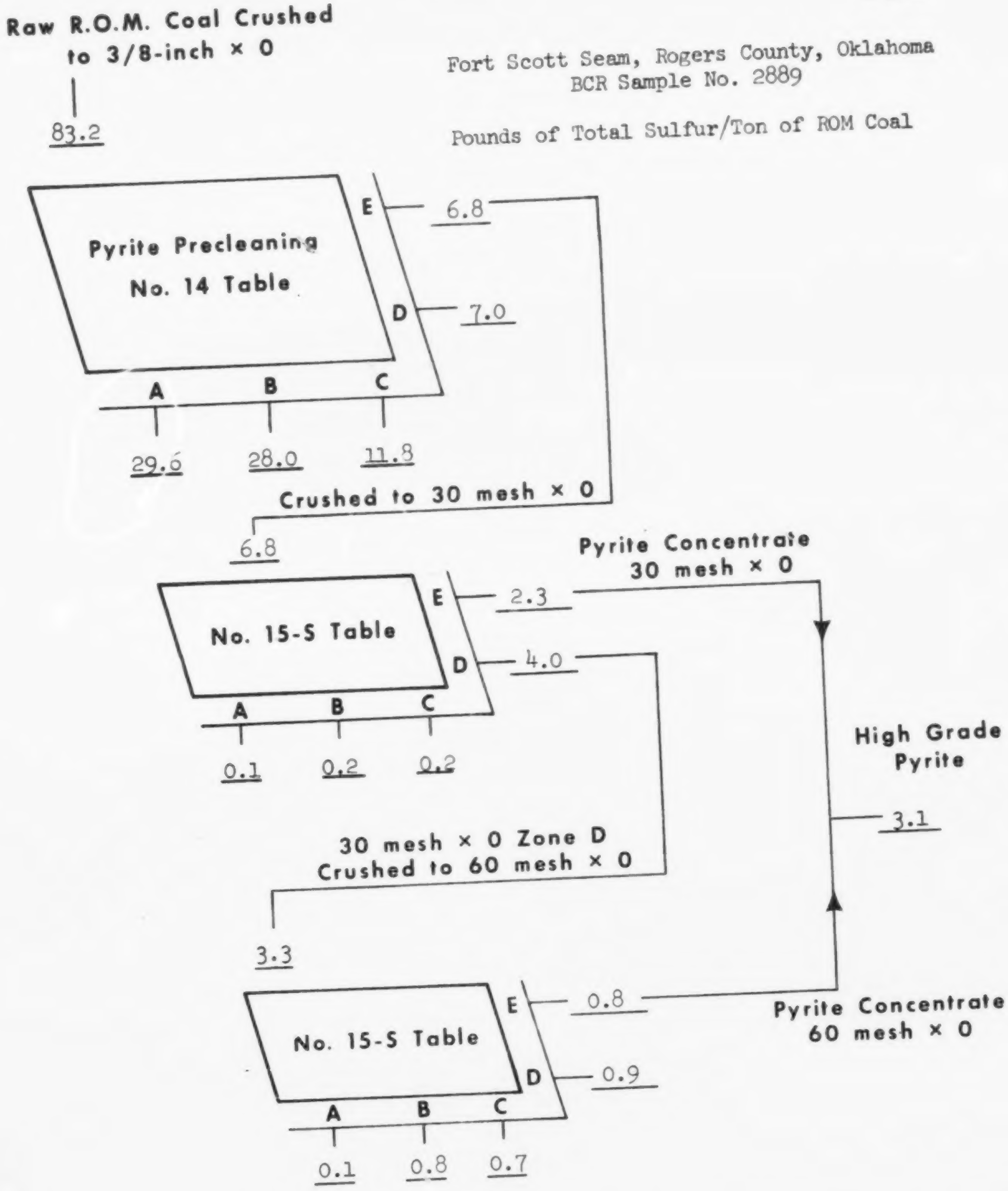
	Product, Weight %	Chemical Analysis, Dry Basis, Weight % Ash	Total Sulfur
Analysis of Feed to Table		70.3	12.0
Zone E (Pyrite Zone)	6.1	73.2	39.8

Two Stage Pyrite Product	0.36	70.9	42.9

Table A48

Fort Scott Seam, Rogers County, Oklahoma
BCR Sample No. 2889

Pounds of Total Sulfur/Ton of ROM Coal


Raw R.O.M. Coal Crushed to 3/8-inch × 0
83.2
Pyrite Precleaning No. 14 Table
E
6.8
D
7.0
A
B
C
29.6
28.0
11.8
Crushed to 30 mesh × 0
6.8
No. 15-S Table
E
2.3
D
4.0
Pyrite Concentrate 30 mesh × 0
A
B
C
0.1
0.2
0.2
High Grade Pyrite
3.1
30 mesh × 0 Zone D Crushed to 60 mesh × 0
3.3
No. 15-S Table
E
0.8
D
0.9
Pyrite Concentrate 60 mesh × 0
A
B
C
0.1
0.8
0.7

Flowsheet for Pyrite Benefication Tests

Table A49

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Flowsheet Data for Pyrite Beneficiation Tests

Coal Identification Fort Scott Seam, Rogers County, Oklahoma

BCR Sample No. 2889

Fraction	Weight Percent		Chemical Analysis, Dry Basis Weight Percent	
			Ash	Total Sulfur
Table No. 14				
Zone A	43.0		6.51	3.44
Zone B	39.2		5.12	3.58
Zone C	10.8		26.4	5.49
Zone D	4.8		66.6	7.17
Zone E		2.2	69.3	15.3
Table No. 15-S (30 Mesh x 0)				
Zone A	0.08		67.1	7.96
Zone B	0.13		68.5	7.89
Zone C	0.15		62.8	7.74
Zone D		1.58	73.8	12.2
Zone E	0.26		70.0	44.1
Table No. 15-S (60 Mesh x 0)				
Zone A	0.07		68.5	9.53
Zone B	0.39		69.0	9.71
Zone C	0.35		70.7	9.06
Zone D	0.67		71.0	6.52
Zone E	0.10		73.2	39.8
Composite of Fractions	100.0		12.4	4.12
Analysis of Feed Coal			13.3	4.21

Table A50

Evaluation of Coal Cleaning Processes
for Removing Pyritic Sulfur from

Concentrating Table Tests--3/8 Inch x O

Ash Characteristics

Coal Identification Fort Scott Seam, Rogers County, Oklahom

Raw Run-of-mine Coal Crushed to 3/8 Inc

Table Products	Product Weight Percent	Float and Sink Weight %	Chemical Analysis, Dry Basis, Weight Percent							Reducin	
			Moisture	Ash	Total Sulfur	Sulfate Sulfur	Pyritic Sulfur	Organic Sulfur	Btu/lb	IDT	ST,
Zone A	43.0		1.60	6.51	3.44	0.02	2.10	1.32	13,962	1915	192
Zone B	39.2		1.42	5.12	3.58	0.04	2.26	1.28	14,144	1910	192
Zone C			0.99	27.5	5.38	0.06	4.44	0.88	10,332	1920	199
1.60 Float	7.0	64.6	0.98	8.85	5.30	0.04	4.10	1.16	13,482	1860	186
1.60 by 1.90	1.3	12.6	1.07	34.7	7.02	0.08	6.44	0.50	8,718	2140	231
1.90 Sink	2.5	22.8	0.64	71.4	5.20	0.13	4.91	0.16	2,532	2040	212
Composite	10.8	100.0		26.4	5.49	0.06	4.58	0.85	10,385		
Zone D			0.46	65.8	6.93	0.11	6.61	0.21	2,920	2060	210
1.90 Float	0.6	12.0	1.46	15.4	5.12	0.04	4.06	1.02	12,549	2240	230
1.90 by 2.95	3.7	78.0	0.64	73.6	4.53	0.08	4.34	0.11	1,462	2180	228
2.95 Sink	0.5	10.0	0.38	73.5	30.2	0.36	29.7	0.10	1,823	2095	210
Composite	4.8	100.0		66.6	7.17	0.10	6.84	0.22	2,829		
Zone E			0.28	72.4	14.6	0.18	14.3	0.12	1,440	2100	214
2.95 Float	1.4	64.5	0.33	67.0	4.37	0.06	4.19	0.12	1,459	2245	227
2.95 Sink	0.8	35.5	0.26	73.4	35.2	0.32	34.8	0.09	1,696	2080	209
Composite	2.2	100.0		69.3	15.3	0.15	15.0	0.11	1,542		
Composite of Table Products	100.0			12.4	4.16	0.04	2.94	1.17	12,839		
Analysis of Feed to Table			1.22	13.3	4.21	0.08	2.96	1.17	12,882	1890	197

Run Date: 9-17-71

IDT
ST,S
ST,H
FT

A50

ng Processes and Techniques
Sulfur from Fine Coal

3/8 Inch x 0 Rough Cleaning

teristics

unty, Oklahoma

ed to 3/8 Inch x 0

BCR Sample No. 2889

	Ash Fusibility								Ash Spectrography ‡							
	Reducing Atmosphere				Oxidizing Atmosphere											
lb	IDT	ST,S	ST,H	FT	IDT	ST,S	ST,H	FT	SiO_2	Al_2O_3	Fe_2O_3	MgO	CaO	TiO_2	Na_2O	K_2O
2	1915	1920		2200	2240	2440		2540	39.1	14.1	34.1	1.01	8.26	0.74	0.94	2.2
4	1910	1925		2180	2460	2520		2580	30.4	11.5	45.5	0.79	7.12	0.66	0.81	0.9
2	1920	1995		2110	2120	2140		2375	41.9	8.71	21.9	0.64	20.4	0.49	0.75	2.0
2	1860	1865		2060	2505	2680		2750	20.6	11.2	56.1*	0.67	9.06	0.50	0.38	1.0
8	2140	2310		2370	2180	2235		2305	22.6	9.47	28.5	0.74	34.4*	0.36	0.26	1.2
2	2040	2120		2200	2140	2160		2440	52.0	9.43	12.2	0.81	21.9	0.51	0.76	1.7
5																
0	2060	2100		2140	2140	2160		2170	40.6	8.56	17.3	0.71	29.7*	0.34	0.45	0.9
9	2240	2300		2340	2240	2260		2340	20.4	8.71	36.7	0.58	29.4	0.34	0.34	1.7
2	2180	2280		2340	2150	2160		2300	45.9	7.58	8.50	0.70	32.1*	0.33	0.52	1.7
3	2095	2100		2105	2280	2740		2750+	12.7*	3.29*	60.1*	0.36	19.8	0.25	0.08	<0.3
9																
0	2100	2140		2180	2140	2160		2200	28.4	4.71*	31.0	0.47	32.2*	0.17	0.24	0.4
9	2245	2270		2320	2200	2200		2240	35.2	4.69*	8.69	0.72	46.9*	0.22	0.29	0.4
6	2080	2090		2095	2750+	2750+		2750+	13.8*	2.92*	64.2*	0.36	14.9	0.15	0.08	<0.4
2																
39																
2	1890	1970		2065	2115	2135		2270	38.6	9.46	27.3	0.79	20.2	0.54	0.74	2.0

IDT - Initial Deformation Temperature
ST,S - Softening Temperature, Spherical
ST,H - Softening Temperature, Hemispherical
FT - Fluid Temperature

* Extrapolated Values
‡ Calculated to moisture and SO_3-free basis

Table A51

SCREEN ANALYSIS

Coal Identification Lower Freeport Seam, Butler County, Pennsylvania

BCR Sample No. 2900

Raw Run-of-Mine Coal Crushed to 3/8 Inch x 0

Screen Size	Weight Percent	Cumulative
Plus 1/4"	10.5	10.5
1/4" x 6 M	28.8	39.3
6 M x 12 M	23.3	62.6
Minus 12 M	37.4	100.0
Total	100.0	

Zones A, B, and C From 3/8 Inch x 0 Run (10-18-71) Crushed to 30 Mesh x 0

Screen Size	Weight Percent	Cumulative
Plus 30 M	10.2	10.2
30 M x 50 M	27.6	37.8
50 M x 100 M	20.8	58.6
Minus 100 M	41.4	100.0
Total	100.0	

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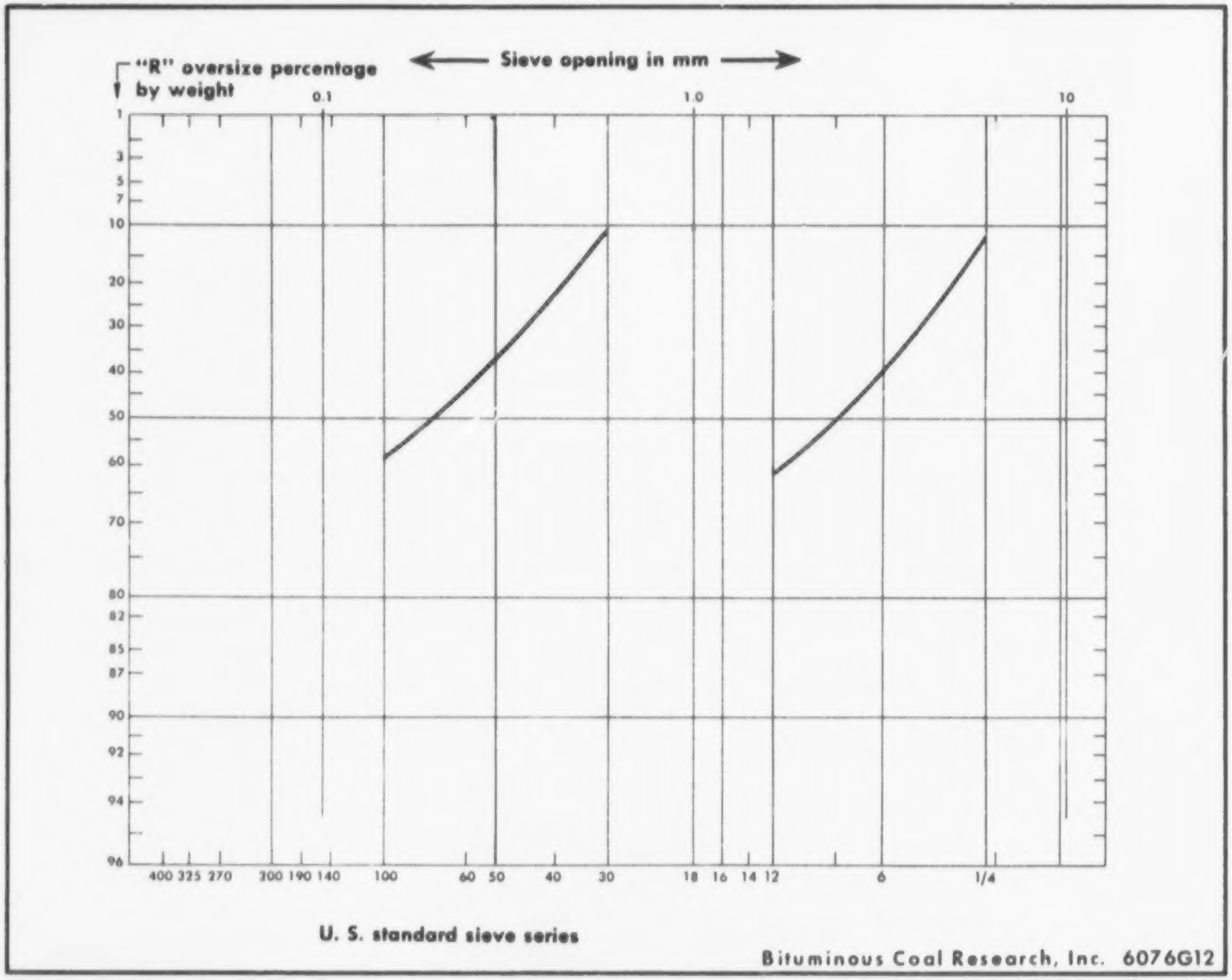


Bituminous Coal Research, Inc. 6076G12

Figure A-6. Size Distribution Curves of 30 Mesh × 0 and 3/8 Inch × 0 Concentrating Table Feed for Lower Freeport Seam, Butler County, Pennsylvania, BCR Sample No. 2900

Table A52

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table Tests--3/8 Inch x 0 Rough Cleaning and Pyrite Precleaning

Coal Identification Lower Freeport Seam, Butler County, Pennsylvania

Raw Run-of-Mine Coal Crushed to 3/8 Inch x 0

BCR Sample No. 2900

Table Products	Product Weight Percent	Float and Sink Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
			Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	43.9		1.20	11.7	2.20	
Zone B	42.3		1.15	11.8	2.22	
Zone C						
Float at 1.60	5.8	52.3	0.92	15.8	3.16	
1.60 by 1.90	2.2	20.2	1.26	33.8	9.10	
Sink at 1.90	3.1	27.5	0.94	60.4	15.2	
Composite	11.1	100.0		31.7	7.67	
Zone D						
Float at 1.90	0.3	11.8	1.02	18.8	4.41	
1.90 by 2.95	1.1	54.5	0.90	64.6	14.2	
Sink at 2.95	0.7	33.7	0.27	60.4	41.0	
Composite	2.1	100.0		57.8	22.1	
Zone E						
Float at 2.95	0.1	24.2	0.78	56.3	16.4	
Sink at 2.95	0.5	75.8	0.18	62.4	42.2	
Composite	0.6	100.0		60.9	36.0	
Composite of Zones A, B, C	97.3			14.0	2.83	
Composite of 1.60 Float Fractions	92.0			12.0	2.27	
Composite of 2.95 Sink Fractions	1.2			61.2	41.5	
Composite of Table Products	100.0			15.2	3.44	
Analysis of Feed to Table			1.96	15.0	3.36	

Run Date: 10-18-71

Table A53

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table Tests--30 Mesh x 0 Deep Cleaning

Coal Identification Lower Freeport Seam, Butler County, Pennsylvania

Zones A, B, and C, 3/8 Inch x 0 Run (10-18-71) Crushed to 30 Mesh x 0

BCR Sample No. 2900

Table Products	Product Weight Percent	Float and Sink Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
			Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	78.1		1.16	11.4	2.14	
Zone B	13.8		1.10	13.4	1.92	
Zone C						
Float at 1.60	1.6	90.9	0.94	18.6	2.06	
Sink at 1.60	0.2	9.1	0.65	44.2	13.4	
Composite	1.8	100.0		20.9	3.09	
Zone D						
Float at 1.60	2.5	42.9	0.75	25.4	2.70	
1.60 by 2.95	2.8	49.6	0.72	48.0	9.26	
Sink at 2.95	0.4	7.5	0.18	61.2	42.1	
Composite	5.7	100.0		39.3	8.91	
Zone E						
Float at 2.95	0.1	13.7	0.56	60.8	17.2	
Sink at 2.95	0.5	86.3	0.17	63.2	44.6	
Composite	0.6	100.0		62.9	40.8	
Composite of Zones A, B, C	93.7			11.9	2.13	
Composite of 1.60 Float Fractions	96.0			12.2	2.12	
Composite of 2.95 Sink Fractions	0.9			62.3	43.5	
Composite of Table Products	100.0			13.7	2.74	
Analysis of Feed to Table			1.21	14.1	2.84	

Run Date: 10-28-71

Table A54

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table Tests--Effects of Two-stage Cleaning

Coal Identification Lower Freeport Seam, Butler County, Pennsylvania

Composite of 3/8 Inch x 0 Run (10-18-71) and 30 Mesh x 0 Run (10-28-71)

BCR Sample No. 2900

Table Products	Product Weight Percent	Float and Sink Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
			Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	76.0			11.4	2.14	
Zone B	13.4			13.4	1.92	
Zone C						
Float at 1.60	1.6	90.9		18.6	2.06	
Sink at 1.60	1.2	9.1		44.2	13.4	
Composite	1.8	100.0		20.9	3.09	
Zone D						
Float at 2.95	6.5	85.5		41.6	7.57	
Sink at 2.95	1.1	14.5		60.7	41.4	
Composite	7.6	100.0		44.4	12.5	
Zone E						
Float at 2.95	0.2	16.7		58.6	16.8	
Sink at 2.95	1.0	83.3		62.8	43.4	
Composite	1.2	100.0		62.1	39.0	
Composite of Zones A, B, C	91.2			11.9	2.13	
Composite of 1.60 Float Fractions	91.0			11.8	2.11	
Composite of 2.95 Sink Fractions	2.1			61.7	42.4	
Composite of Table Products	100.0			15.0	3.36	
Analysis of Feed to Table			1.96	15.0	3.36	

Table A55

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table No. 15-S Tests - Pyrite Beneficiation

Coal Identification Lower Freeport Seam, Butler County, Pennsylvania

Zone E, 3/8 Inch x 0 Run (10-18-71) Crushed to 30 Mesh x 0

BCR Sample No. 2900

Table Products	Product, Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
		Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	3.8	0.76	38.9	18.4	
Zone B	5.3	0.76	39.0	17.8	
Zone C	4.6	0.72	36.2	16.0	
Zone D	29.8	0.48	57.2	21.6	
Zone E	56.5	0.12	64.0	45.1	
Composite of Table Products	100.0		58.4	34.3	
Analysis of Feed to Table			60.9	36.0	

Run Date: 10-29-71

Table A56

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table No. 15-S Tests - Pyrite Beneficiation

Coal Identification Lower Freeport Seam, Butler County, Pennsylvania

Zone D, 30 Mesh x 0 Run (10-29-71) Crushed to 60 Mesh x 0

BCR Sample No. 2900

Table Products	Product, Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
		Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	14.6	0.30	53.2	20.0	
Zone B	27.2	0.21	52.5	18.0	
Zone C	17.8	0.17	50.8	16.0	
Zone D	29.6	0.26	66.4	18.8	
Zone E	10.8	0.09	66.1	46.0	
Composite of Table Products	100.0		57.9	21.2	
Analysis of Feed to Table		0.46	57.4	22.4	

Run Date: 11-10-71

Table A57

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Pyrite Beneficiation - Effects of Two-stage Cleaning

Coal Identification Lower Freeport Seam, Butler County, Pennsylvania

BCR Sample No. 2900

Pyrite Precleaning

Concentrating Table No. 14 Test Run Date 10-18-71

Feed to Concentrating Table: Raw Run-of-Mine Coal Crushed to 3/8 Inch x 0

	Product, Weight %	Chemical Analysis, Dry Basis, Weight %	
		Ash	Total Sulfur
Analysis of Feed to Table		15.0	3.36
Zone E (Pyrite Zone)	0.6	60.9	36.0

Pyrite Cleaning

Concentrating Table No. 15-S Test Run Date 10-29-71

Feed to Concentrating Table: Zone E, 3/8 Inch x 0 Run (10-29-71) Crushed to 30 Mesh x 0

	Product, Weight %	Chemical Analysis, Dry Basis, Weight %	
		Ash	Total Sulfur
Analysis of Feed to Table		60.9	36.0
Zone E (Pyrite Zone)	56.5	64.0	45.1

Concentrating Table No. 15-S Test Run Date 11-10-71

Feed to Concentrating Table: Zone D, 30 Mesh x 0 Run (10-28-71) Crushed to 60 Mesh x 0

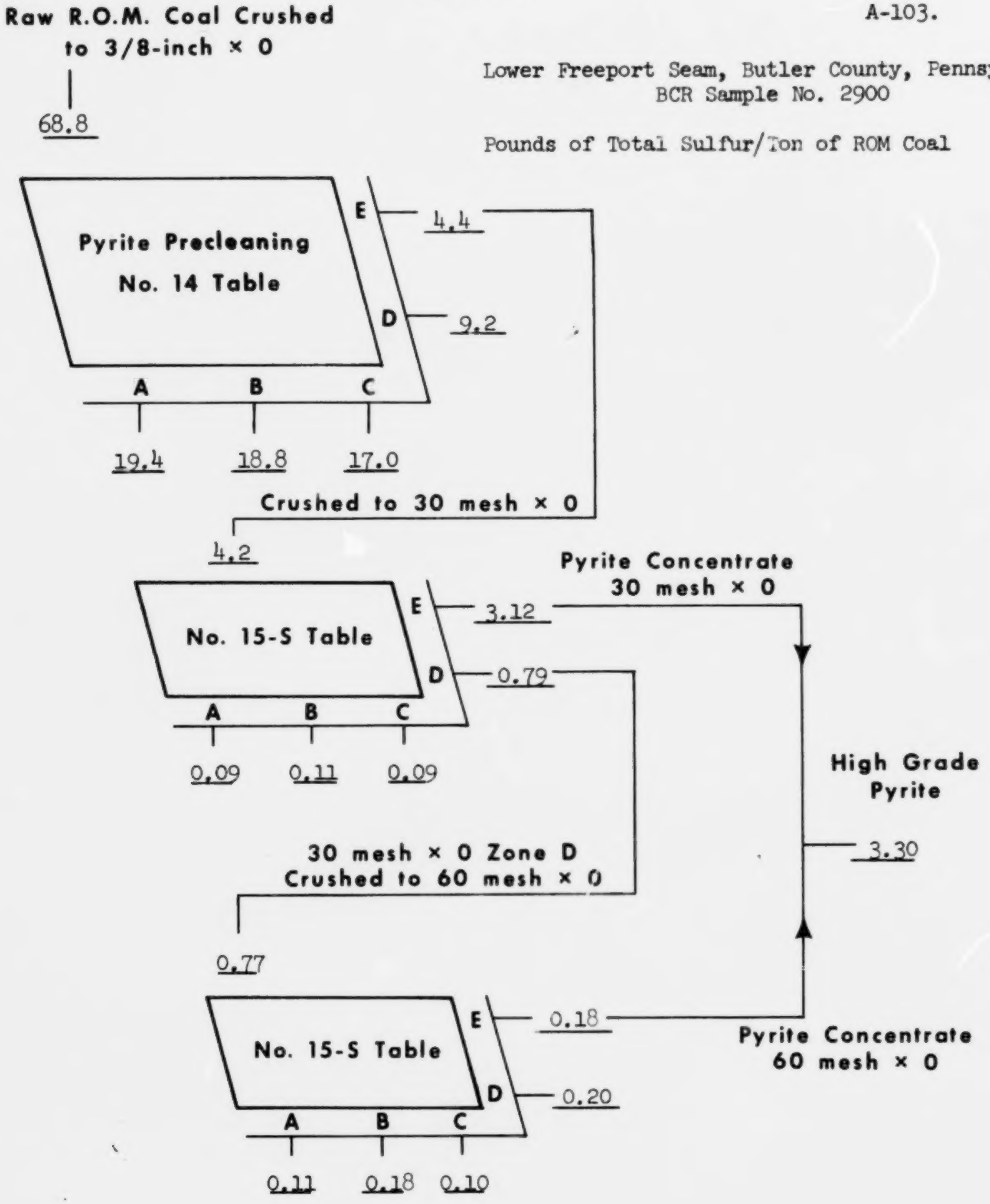
	Product, Weight %	Chemical Analysis, Dry Basis, Weight %	
		Ash	Total Sulfur
Analysis of Feed to Table		57.4	22.4
Zone E (Pyrite Zone)	10.8	66.1	46.0

Two Stage Pyrite Product	0.36	64.1	45.2

Table A58

Lower Freeport Seam, Butler County, Pennsylvania
BCR Sample No. 2900

Pounds of Total Sulfur/Ton of ROM Coal


Raw R.O.M. Coal Crushed to 3/8-inch × 0
68.8
Pyrite Precleaning No. 14 Table
E
4.4
D
9.2
A
B
C
19.4
18.8
17.0
Crushed to 30 mesh × 0
4.2
No. 15-S Table
E
3.12
D
0.79
Pyrite Concentrate 30 mesh × 0
A
B
C
0.09
0.11
0.09
High Grade Pyrite
3.30
30 mesh × 0 Zone D Crushed to 60 mesh × 0
0.77
No. 15-S Table
E
0.18
D
0.20
Pyrite Concentrate 60 mesh × 0
A
B
C
0.11
0.18
0.10

Flowsheet for Pyrite Benefication Tests

Table A59

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Flowsheet Data for Pyrite Beneficiation Tests

Coal Identification Lower Freeport Seam, Butler County, Pennsylvania

BCR Sample No. 2900

Fraction	Weight Percent		Chemical Analysis, Dry Basis Weight Percent	
			Ash	Total Sulfur
Table No. 14				
Zone A	43.9		11.7	2.20
Zone B	42.3		11.8	2.22
Zone C	11.1		31.7	7.67
Zone D	2.1		57.8	22.1
Zone E		0.6	60.9	36.0
Table No. 15-S (30 Mesh x 0)				
Zone A	0.02		38.9	18.4
Zone B	0.03		39.0	17.8
Zone C	0.03		36.2	16.0
Zone D		0.18	57.2	21.6
Zone E	0.34		64.0	45.1
Table No. 15-S (60 Mesh x 0)				
Zone A	0.03		53.2	20.0
Zone B	0.05		52.5	18.0
Zone C	0.03		50.8	16.0
Zone D	0.05		66.4	18.8
Zone E	0.02		66.1	46.0
Composite of Fractions			15.2	3.43
Analysis of Feed Coal			15.0	3.36

Table A60

Evaluation of Coal Cleaning Process
for Removing Pyritic Sulfur fr

Concentrating Table Tests--3/8 Inch x

Ash Characteristics

Coal Identification Lower Freeport Seam, Butler County, F

Raw Run-of-Mine Crushed to 3/8 inch x

Table Products	Product Weight Percent	Float and Sink Weight %	Chemical Analysis, Dry Basis, Weight Percent							Reduc
			Moisture	Ash	Total Sulfur	Sulfate Sulfur	Pyritic Sulfur	Organic Sulfur	Btu/lb	IDT
Zone A	43.9		1.20	11.7	2.20	--	1.64	0.56	13,073	2500
Zone B	42.3		1.15	11.8	2.22	0.01	1.61	0.60	13,092	2540
Zone C			0.64	32.4	8.41	0.06	7.83	0.52	9,560	1980
1.60 Float	5.8	52.3	0.92	15.8	3.16	--	2.65	0.51	12,377	2460
1.60 by 1.90	2.2	20.2	1.26	33.8	9.10	0.04	8.66	0.40	9,180	1960
1.90 Sink	3.1	27.5	0.94	60.4	15.2	0.06	15.0	0.15	4,638	1960
Composite	11.1	100.0		31.7	7.67	0.02	7.26	0.39	9,603	
Zone D			0.46	57.8	23.0	0.08	22.4	0.48	4,883	2000
1.90 Float	0.3	11.8	1.02	18.8	4.41	--	3.91	0.50	11,874	2040
1.90 by 2.95	1.1	54.5	0.90	64.6	14.2	0.06	13.9	0.26	3,994	2000
2.95 Sink	0.7	33.7	0.27	60.4	41.0	0.14	40.6	0.30	3,234	2380
Composite	2.1	100.0		57.8	22.1	0.08	21.7	0.30	4,668	
Zone E			0.30	62.0	38.0	0.20	37.4	0.36	3,558	2340
2.95 Float	0.1	24.2	0.78	56.3	16.4	0.07	16.0	0.30	5,286	1960
2.95 Sink	0.5	75.8	0.18	62.4	42.2	0.18	41.7	0.32	2,870	2380
Composite	0.6	100.0		60.9	36.0	0.15	35.5	0.32	3,455	
Composite of Table Products	100.0			15.2	3.44	0.01	2.88	0.55	12,462	
Analysis of Feed to Table			1.96	15.0	3.36	0.04	2.78	0.54	12,576	2120

A

Run Date: 10-18-71

A60

Processes and Techniques
ulfur from Fine Coal

8 Inch x 0 Rough Cleaning

ristics

ounty, Pennsylvania

8 inch x 0

BCR Sample No. 2900

Ash Fusibility								Ash Spectrography							
Reducing Atmosphere				Oxidizing Atmosphere											
IDT	ST,S	ST,H	FT	IDT	ST,S	ST,H	FT	SiO_2	Al_2O_3	Fe_2O_3	MgO	CaO	TiO_2	Na_2O	K_2O
2500	2580		2720	2700	2750+		2750+	49.0	27.0	17.5	0.58	0.78	1.13	0.19	2.2
2540	2580		2700	2680	2740		2750+	49.0	28.3	17.9	0.58	0.81	1.13	0.18	2.0
1980	2060		2300	2530	2570		2600	41.0	23.0	31.0	0.58	0.45	0.79	0.17	2.1
2460	2500		2680	2640	2680		2750+	47.0	26.8	19.9	0.51	0.55	1.00	0.18	2.2
1960	2040		2450	2540	2560		2600	37.5	22.5	34.5	0.35	0.38	0.80	0.16	2.0
1960	2020		2220	2540	2580		2620	35.0	21.0	39.5	0.55	0.35	0.63	0.14	2.0
2000	2040		2180	2600	2620		2640	27.5	15.6	52.0*	0.43	0.31	0.48	0.13	1.8
2040	2160		2500	2540	2580		2720	42.0	25.5	28.0	0.38	0.54	1.03	0.16	1.9
2000	2220		2460	2540	2560		2620	39.0	24.0	31.1	0.66	0.40	0.73	0.22	2.7
2380	2400		2420	2680	2750+		2750+	7.70*	2.50*	88.0‡	<0.2	0.30	<0.10	<0.05	<0.3
2340	2360		2440	2640	2750+		2750+	13.0*	7.10*	78.0‡	0.33	0.33	0.17	<0.05	0.8
1960	1980		2300	2520	2560		2600	35.5	19.0	40.0	0.45	0.41	0.58	0.16	2.0
2380	2400		2420	2750+	2750+		2750+	11.0*	3.50*	84.0‡	0.30	0.27	<0.10	<0.05	0.3
2120	2340		2540	2560	2620		2700	45.0	25.0	23.5	0.55	0.68	0.96	0.19	2.2

IDT	-	Initial Deformation Temperature
ST,S	-	Softening Temperature, Spherical
ST,H	-	Softening Temperature, Hemispherical
FT	-	Fluid Temperature

* Extrapolated Values
‡ By Difference

10

Table A61

Screen Analysis

Coal Identification Baxter Seam, Crawford County, Kansas

BCR Sample No. 2926

Raw Run-of-Mine Coal Crushed to 3/8 Inch x 0

Screen Size	Weight Percent	Cumulative
Plus 1/4"	10.3	10.3
1/4" x 6 M	25.9	36.2
6 M x 12 M	23.5	59.7
Minus 12 M	40.3	100.0
Total	100.0	

Zones A, B, and C from 3/8 Inch x 0 Run (1-21-72) Crushed to 30 Mesh x 0

Screen Size	Weight Percent	Cumulative
Plus 30 M	7.9	7.9
30 M x 50 M	25.7	33.6
50 M x 100 M	21.3	54.9
Minus 100 M	45.1	100.0
Total	100.0	

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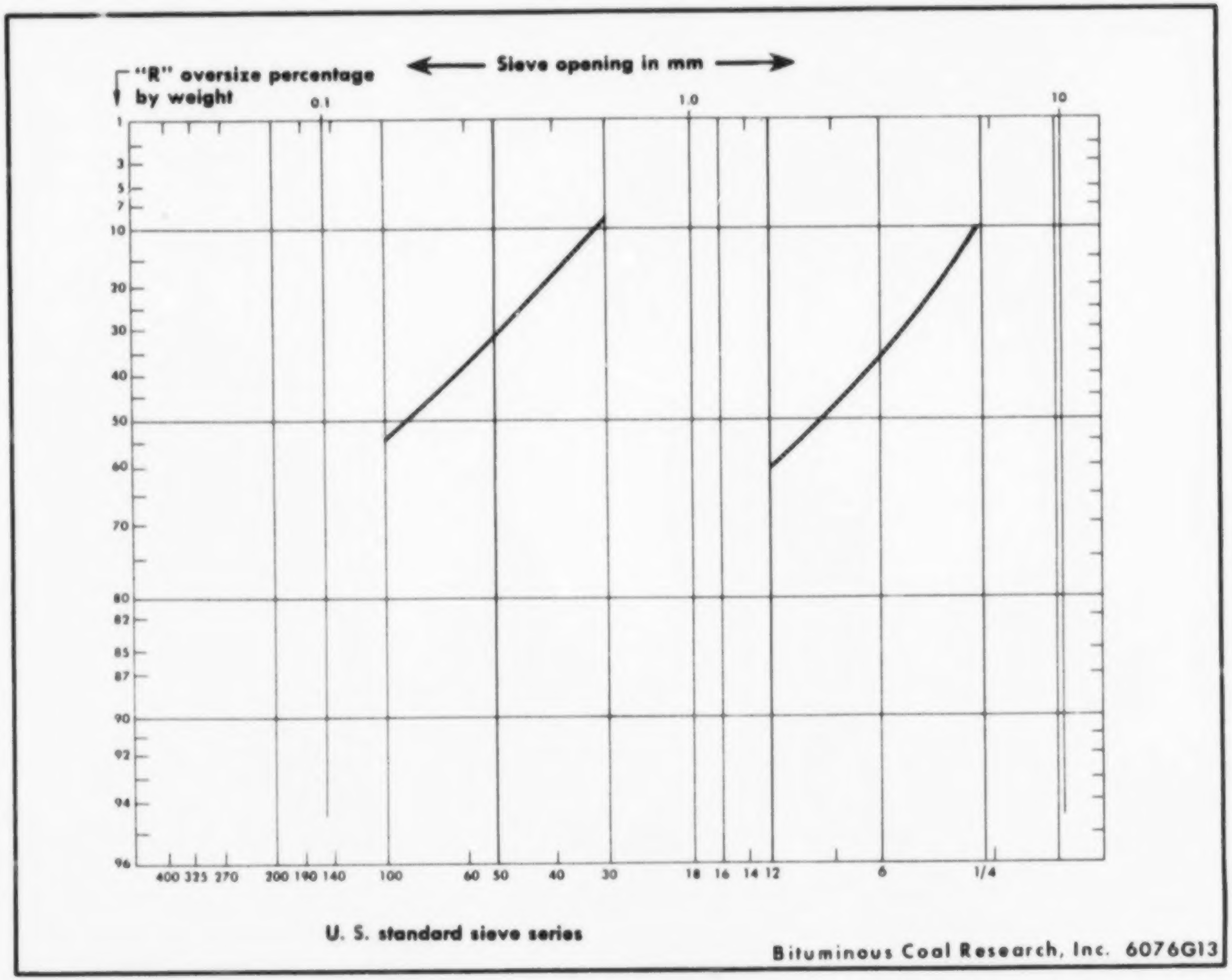


Bituminous Coal Research, Inc. 6076G13

Figure A-7. Size Distribution Curves of 30 Mesh × 0 and 3/8 Inch × 0 Concentrating Table Feed for Baxter Seam, Crawford County, Kansas, BCR Sample No. 2926

Table A62

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table Tests--3/8 Inch x 0 Rough Cleaning and Pyrite Precleaning

Coal Identification Baxter Seam, Crawford County, Kansas

Raw Run-of-Mine Coal Crushed to 3/8 Inch x 0

BCR Sample No. 2926

Table Products	Product Weight Percent	Float and Sink Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
			Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	27.2		0.60	10.5	2.92	
Zone B	46.0		0.46	9.66	3.06	
Zone C						
Float at 1.60	18.9	80.4	0.70	11.0	3.71	
1.60 by 1.90	1.1	4.6	0.46	35.5	10.4	
Sink at 1.90	3.5	15.0	0.28	63.4	13.8	
Composite	23.5	100.0		20.0	5.53	
Zone D						
Float at 1.90	0.4	15.2	1.10	14.6	4.40	
1.90 by 2.95	1.2	53.4	0.30	68.0	7.36	
Sink at 2.95	0.7	31.4	0.23	65.2	37.8	
Composite	2.3	100.0		59.0	16.5	
Zone E						
Float at 2.95	0.5	51.0	0.23	68.6	4.72	
Sink at 2.95	0.5	49.0	0.25	67.0	39.8	
Composite	1.0	100.0		67.8	21.9	
Composite of Zones A, B, C	96.7			12.4	3.62	
Composite of 1.60 Float Fractions	92.1			10.2	3.15	
Composite of 2.95 Sink Fractions	1.2			66.0	38.6	
Composite of Table Products	100.0			14.0	4.10	
Analysis of Feed to Table			2.69	14.8	4.02	

Run Date: 1-21-72

Table A63

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table Tests--30 Mesh x 0 Deep Cleaning

Coal Identification Baxter Seam, Crawford County, Kansas

Zones A, B, and C, 3/8 Inch x 0 Run (1-21-72) Crushed to 30 Mesh x 0

BCR Sample No. 2926

Table Products	Product Weight Percent	Float and Sink Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
			Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	81.4		0.52	9.99	3.10	
Zone B	13.9		0.38	10.4	3.08	
Zone C						
Float at 1.60	2.2	92.4	0.94	14.9	4.22	
Sink at 1.60	0.2	7.6	0.30	51.0	18.6	
Composite	2.4	100.0		17.6	5.31	
Zone D						
Float at 1.60	0.6	27.3	0.49	22.1	7.48	
1.60 by 2.95	1.2	57.4	0.28	60.0	9.57	
Sink at 2.95	0.3	15.3	0.20	65.8	39.0	
Composite	2.1	100.0		50.5	13.5	
Zone E						
Float at 2.95	0.1	45.8	0.12	67.6	5.87	
Sink at 2.95	0.1	54.2	0.14	65.8	40.8	
Composite	0.2	100.0		66.6	24.8	
Composite of Zones A, B, C	97.7			10.2	3.15	
Composite of 1.60 Float Fractions	98.1			10.2	3.15	
Composite of 2.95 Sink Fractions	0.4			65.8	39.5	
Composite of Table Products	100.0			11.2	3.41	
Analysis of Feed to Table			0.21	11.8	3.50	

Run Date: 1-31-72

Table A64

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table Tests--Effects of Two-stage Cleaning

Coal Identification Baxter Seam, Crawford County, Kansas

Composite of 3/8 Inch x 0 Run (1-21-72) and 30 Mesh x 0 Run (1-31-72)

BCR Sample No. 2926

Table Products	Product Weight Percent	Float and Sink Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
			Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	78.7			9.99	3.10	
Zone B	13.5			10.4	3.08	
Zone C						
Float at 1.60	2.1	92.4		14.9	4.22	
Sink at 1.60	0.2	7.6		51.0	18.6	
Composite	2.3	100.0		17.6	5.31	
Zone D						
Float at 2.95	3.3	76.7		51.8	7.83	
Sink at 2.95	1.0	23.3		65.4	38.2	
Composite	4.3	100.0		55.0	14.9	
Zone E						
Float at 2.95	0.6	50.0		68.4	4.91	
Sink at 2.95	0.6	50.0		66.8	40.0	
Composite	1.2	100.0		67.6	22.5	
Composite of Zones A, B, C	94.5			10.2	3.15	
Composite of 1.60 Float Fractions	94.3			10.2	3.12	
Composite of 2.95 Sink Fractions	1.6			65.9	38.9	
Composite of Table Products	100.0			12.8	3.89	
Analysis of Feed to Table				14.8	4.02	

Table A65

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table No. 15-S Tests - Pyrite Beneficiation

Coal Identification Baxter Seam, Crawford County, Kansas

Zone E, 3/8 Inch x 0 Run (1-21-72) Crushed to 30 Mesh x 0

BCR Sample No. 2926

Table Products	Product, Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
		Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	3.1	0.18	56.4	19.9	
Zone B	9.5	0.16	57.6	18.6	
Zone C	4.9	0.17	58.2	17.2	
Zone D	58.6	0.06	67.8	13.8	
Zone E	23.9	0.03	66.0	44.9	
Composite of Table Products	100.0		65.6	22.0	
Analysis of Feed to Table		0.18	66.2	21.9	

Run Date: 2-4-72

Table A66

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table No. 15-S Tests - Pyrite Beneficiation

Coal Identification Baxter Seam, Crawford County, Kansas

Zone D, 30 Mesh x 0 Run (2-4-72) Crushed to 60 Mesh x 0

BCR Sample No. 2926

Table Products	Product, Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
		Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	4.3	0.10	64.6	15.0	
Zone B	35.7	0.06	65.0	14.3	
Zone C	27.9	0.08	66.0	12.8	
Zone D	27.9	0.01	63.2	8.90	
Zone E	4.2	0.02	66.6	32.5	
Composite of Table Products	100.0		64.8	13.2	
Analysis of Feed to Table		0.04	64.9	13.2	

Run Date: 2-7-72

Table A67

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Pyrite Beneficiation - Effects of Two-stage Cleaning

Coal Identification Baxter Seam, Crawford County, Kansas

BCR Sample No. 2926

Pyrite Precleaning

Concentrating Table No. 14 Test Run Date 1-21-72
Feed to Concentrating Table: Raw Run-of-Mine Coal Crushed to 3/8 Inch x 0

	Product, Weight %	Chemical Analysis, Dry Basis, Weight % Ash	Total Sulfur
Analysis of Feed to Table		14.8	4.02
Zone E (Pyrite Zone)	1.0	67.8	21.9

Pyrite Cleaning

Concentrating Table No. 15-S Test Run Date 2-4-72
Feed to Concentrating Table: Zone E, 3/8 Inch x 0 Run (1-21-72) Crushed to 30 Mesh x 0

	Product, Weight %	Chemical Analysis, Dry Basis, Weight % Ash	Total Sulfur
Analysis of Feed to Table		66.2	21.9
Zone E (Pyrite Zone)	23.9	65.6	22.0

Concentrating Table No. 15-S Test Run Date 2-7-72
Feed to Concentrating Table: Zone D, 30 Mesh x 0 Run (2-4-72) Crushed to 60 Mesh x 0

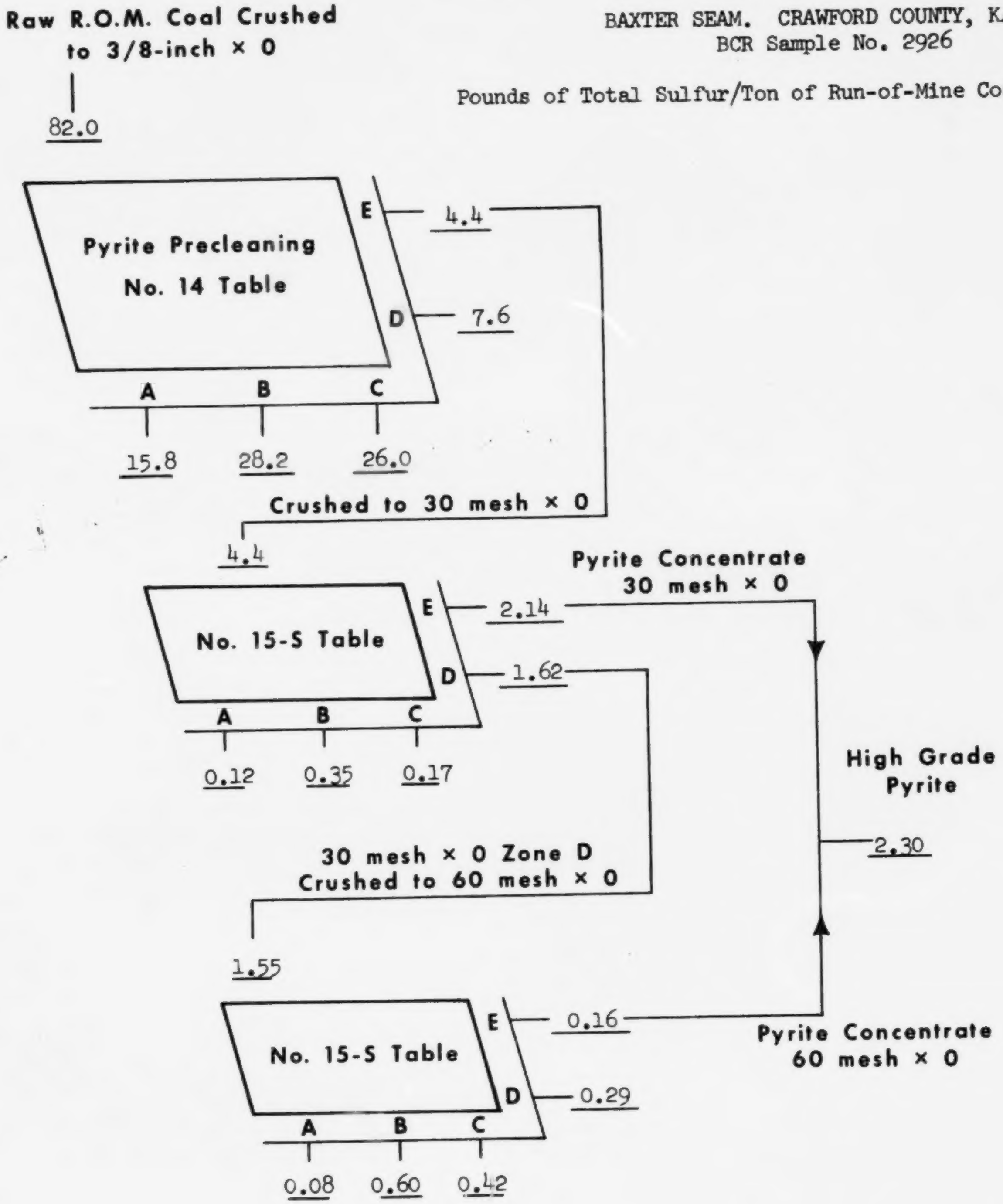
	Product, Weight %	Chemical Analysis, Dry Basis, Weight % Ash	Total Sulfur
Analysis of Feed to Table		64.9	13.2
Zone E (Pyrite Zone)	4.2	64.8	13.2

Two Stage Pyrite Product	0.27	66.1	43.5

Table A68

BAXTER SEAM. CRAWFORD COUNTY, KANSAS
BCR Sample No. 2926

Pounds of Total Sulfur/Ton of Run-of-Mine Coal


Raw R.O.M. Coal Crushed to 3/8-inch × 0
82.0
Pyrite Precleaning No. 14 Table
E
4.4
D
7.6
A
B
C
15.8
28.2
26.0
Crushed to 30 mesh × 0
4.4
No. 15-S Table
E
2.14
D
1.62
A
B
C
0.12
0.35
0.17
Pyrite Concentrate 30 mesh × 0
High Grade Pyrite
2.30
30 mesh × 0 Zone D Crushed to 60 mesh × 0
1.55
No. 15-S Table
E
0.16
D
0.29
A
B
C
0.08
0.60
0.42
Pyrite Concentrate 60 mesh × 0

Flowsheet for Pyrite Benefication Tests

Table A69

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Flowsheet Data for Pyrite Beneficiation Tests

Coal Identification Baxter Seam Crawford County, Kansas

BCR Sample No. 2926

Fraction	Weight Percent		Chemical Analysis, Dry Basis Weight Percent	
			Ash	Total Sulfur
Table No. 14				
Zone A	27.2		10.5	2.92
Zone B	46.0		9.66	3.06
Zone C	23.5		20.0	5.53
Zone D	2.3		59.0	16.5
Zone E		1.0	67.8	21.9
Table No. 15-S (30 Mesh x 0)				
Zone A	0.03		56.4	19.9
Zone B	0.09		57.6	18.6
Zone C	0.05		58.2	17.2
Zone D		0.59	67.8	13.8
Zone E	0.24		66.0	44.9
Table No. 15-S (60 Mesh x 0)				
Zone A	0.03		64.6	15.0
Zone B	0.21		65.0	14.3
Zone C	0.16		66.0	12.8
Zone D	0.16		63.2	8.90
Zone E	0.03		66.6	32.5
Composite of Fractions	100.0		14.0	4.10
Analysis of Feed Coal			14.8	4.02

Table A70

Evaluation of Coal Cleaning Processe
for Removing Pyritic Sulfur fro

Concentrating Table Tests--3/8 Inch x

Ash Characteristics

Coal Identification Baxter Seam Crawford County, Kans

Raw Run-of-Mine Coal Crushed to 3/8

Table Products	Product Weight Percent	Float and Sink Weight %	Chemical Analysis, Dry Basis, Weight Percent							Reduc
			Moisture	Ash	Total Sulfur	Sulfate Sulfur	Pyritic Sulfur	Organic Sulfur	Btu/lb	IDT
Zone A	27.2		0.60	10.5	2.92		2.00	0.92	13,544	1955
Zone B	46.0		0.46	9.66	3.06		2.26	0.80	13,689	1940
Zone C			0.31	21.1	5.78	0.02	4.99	0.77	11,624	1890
1.60 Float	18.9	80.4	0.70	11.0	3.71	0.01	2.83	0.87	13,410	1925
1.60 by 1.90	1.1	4.6	0.46	35.5	10.4	0.07	9.9	0.47	9,266	2150
1.90 Sink	3.5	15.0	0.28	63.4	13.8	0.08	13.6	0.14	3,072	2080
Composite	23.5	100.0		20.0	5.53	0.02	4.77	0.74	11,669	
Zone D			0.15	61.1	17.0	0.06	16.7	0.26	3,548	2130
1.90 Float	0.4	15.2	1.10	14.6	4.40	0.01	3.63	0.76	12,877	1900
1.90 by 2.95	1.2	53.4	0.30	68.0	7.36	0.03	7.23	0.10	1,276	2400
2.95 Sink	0.7	31.4	0.23	65.2	37.8	0.13	37.5	0.18	2,484	2310
Composite	2.3	100.0		59.0	16.5	0.06	16.2	0.23	3,419	
Zone E			*1							
2.95 Float	0.5	51.0	0.23	68.6	4.72	0.03	4.58	0.11	1,168	2570
2.95 Sink	0.5	49.0	0.25	67.0	39.8	0.14	39.4	0.26	2,601	2410
Composite	1.0	100.0		67.8	21.9	0.08	21.6	0.18	1,870	
Composite of Table Products	100.0			14.0	4.10	0.01	3.29	0.80	12,820	
Analysis of Feed to Table			2.69	14.8	4.02	0.01	3.23	0.78	12,826	1930

Run Date: 1-21-72

*1 Analyses Unavailable, Insufficient Sample

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ble A70

ng Processes and Techniques
Sulfur from Fine Coal

3/8 Inch x 0 Rough Cleaning

teristics

unty, Kansas

ed to 3/8 Inch x 0

BCR Sample No. 2926

Ash Fusibility								Ash Spectrography							
Reducing Atmosphere				Oxidizing Atmosphere											
IDT	ST,S	ST,H	FT	IDT	ST,S	ST,H	FT	SiO_2	Al_2O_3	Fe_2O_3	MgO	CaO	TiO_2	Na_2O	K_2O
1955	2000		2435	2320	2450		2565	48.3	18.8	23.1	0.88	3.29	0.97	0.37	2.6
1940	1965		2370	2365	2495		2595	46.4	18.5	25.0	0.82	2.40	0.94	0.48	3.1
1890	1965		2305	2205	[illegible]		2510	32.3	13.1	31.9	0.73	17.3	0.58	0.23	1.7
1925	1945		2360	2390	2520		2590	44.8	16.6	31.0	0.83	2.15	0.87	0.30	2.1
2150	2255		2410	2290	2370		2480	16.1*	7.99*	44.4	0.67	27.7*	0.21	0.07	0.6
2080	2120		2240	2220	2230		2300	23.8	11.3	32.5	0.73	29.8*	0.36	0.10	1.1
2130	2160		2210	2215	2350		2405	15.9*	7.91*	39.0	0.59	33.6*	0.27	0.10	0.8
1900	1970		2205	2220	2330		2560	35.1	13.2	34.6	1.04	13.2	0.76	0.18	1.4
2400	2515		2570	2415	2485		2610	25.7	11.4	20.1	0.93	38.2*	0.45	0.10	0.8
2310	2310		2310	2290	2325		2620	6.69*	1.73*	77.7*	0.33	13.5	0.09	0.3	<0.3
2570	2685		2705	2555	2660		2735	21.2	9.68	13.6	0.76	51.6*	0.36	0.09	0.6
2410	2410		2410	2750+	2750+		2750+	5.44*	1.71*	80.0*	0.33	10.0	0.07	0.03	0.3
1930	1970		2300	2260	2340		2505	38.1	15.3	29.1	0.76	12.5	0.75	0.35	1.6

IDT - Initial Deformation Temperature
ST,S - Softening Temperature, Spherical
ST,H - Softening Temperature, Hemispherical
FT - Fluid Temperature

* Extrapolated Values

Table A71

SCREEN ANALYSIS

Coal Identification Clements Seam, Walker County, Alabama

BCR Sample No. 2928

Raw Run-of-Mine Coal Crushed to 3/8 Inch x 0

Screen Size	Weight Percent	Cumulative
Plus 1/4"	8.5	8.5
1/4" x 6 M	26.5	35.0
6 M x 12 M	23.3	58.3
Minus 12 M	41.7	100.0
Total	100.0	

Zones A, B, and C from 3/8 Inch x 0 Run (2-23-72) Crushed to 30 Mesh x 0

Screen Size	Weight Percent	Cumulative
Plus 30 M	8.5	8.5
30 M x 50 M	24.7	33.2
50 M x 100 M	21.0	54.2
Minus 100 M	45.8	100.0
Total	100.0	

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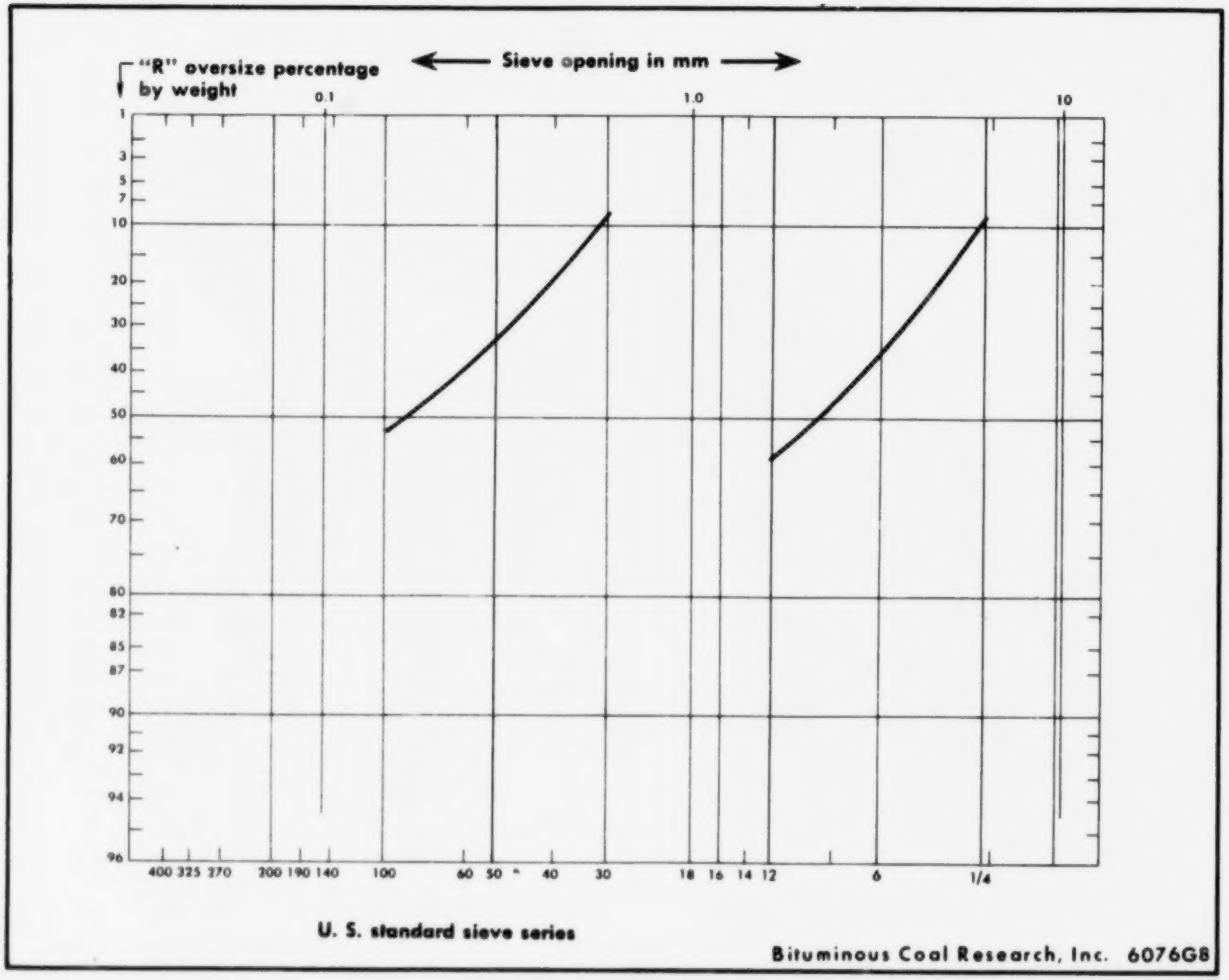


Bituminous Coal Research, Inc. 6076G8

Figure A-8. Size Distribution Curves of 30 Mesh × 0 and 3/8 Inch × 0 Concentrating Table Feed for Clements Seam, Walker County, Alabama, BCR Sample No. 2928

Table A72

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table Tests--3/8 Inch x 0 Rough Cleaning and Pyrite Pre-cleaning

Coal Identification Clements Seam, Walker County, Alabama

Raw Run-of-Mine Coal Crushed to 3/8 Inch x 0

BCR Sample No. 2928

Table Products	Product Weight Percent	Float and Sink Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
			Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	31.5		0.56	9.99	1.40	
Zone B	34.0		0.52	8.02	1.88	
Zone C						
Float at 1.60	12.7	78.2	0.61	11.4	2.81	
1.60 by 1.90	1.6	10.0	0.68	41.2	3.83	
Sink at 1.90	1.9	11.8	0.68	77.3	2.10	
Composite	16.2	100.0		22.2	2.83	
Zone D						
Float at 1.90	1.1	7.3	0.78	28.3	3.53	
1.90 by 2.95	13.5	91.6	0.67	83.3	1.50	
Sink at 2.95	0.2	1.1	0.37	70.3	30.6	
Composite	14.8	100.0		79.1	1.97	
Zone E						
Float at 2.95	3.2	90.5	1.04	84.9	1.84	
Sink at 2.95	0.3	9.5	0.20	68.5	35.8	
Composite	3.5	100.0		83.3	5.07	
Composite of Zones A, B, C	81.7			11.2	1.88	
Composite of 1.60 Float Fractions	78.2			9.36	1.84	
Composite of 2.95 Sink Fractions	0.5			69.2	33.7	
Composite of Table Products	100.0			24.1	2.01	
Analysis of Feed to Table			0.52	25.3	1.96	

Run Date: 2-23-72

Table A73

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table Tests--30 Mesh x 0 Deep Cleaning

Coal Identification Clements Seam, Walker County, Alabama

Zones A, B, and C, 3/8 Inch x 0 Run (2-23-72) Crushed to 30 Mesh x 0

BCR Sample No. 2928

Table Products	Product Weight Percent	Float and Sink Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
			Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	82.4		0.36	6.92	1.66	
Zone B	12.8		0.27	7.88	1.98	
Zone C						
Float at 1.60	1.0	90.9	0.32	13.7	3.34	
Sink at 1.60	0.1	9.1	0.38	54.2	9.40	
Composite	1.1	100.0		17.4	3.89	
Zone D						
Float at 1.60	1.6	50.9	0.14	22.0	4.04	
1.60 by 2.95	1.5	47.3	0.80	51.2	5.34	
Sink at 2.95	0.1	1.8	0.30	64.4	39.5	
Composite	3.2	100.0		36.6	5.29	
Zone E						
Float at 2.95	0.4	82.3	0.62	67.4	5.78	
Sink at 2.95	0.1	17.7	0.18	63.4	38.9	
Composite	0.5	100.0		66.7	11.6	
Composite of Zones A, B, C	96.3			7.16	1.73	
Composite of 1.60 Float Fractions	97.8			7.35	1.76	
Composite of 2.95 Sink Fractions	0.2			63.9	39.2	
Composite of Table Products	100.0			8.41	1.89	
Analysis of Feed to Table			0.52	8.44	1.90	

Run Date: 3-1-72

Table A74

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table Tests--Effects of Two-stage Cleaning

Coal Identification Clements Seam, Walker County, Alabama

Composite of 3/8 Inch x 0 Run (2-23-72) and 30 Mesh x 0 Run (3-1-72)

BCR Sample No. 2928

Table Products	Product Weight Percent	Float and Sink Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
			Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	67.3			6.92	1.66	
Zone B	10.5			7.88	1.98	
Zone C	0.8	90.9		13.7	3.34	
Float at 1.60	0.1	9.1		54.2	9.40	
Sink at 1.60	0.9	100.0		17.4	3.89	
Composite						
Zone D						
Float at 2.95	17.15	98.6		72.8	2.10	
Sink at 2.95	0.25	1.4		69.1	32.4	
Composite	17.40	100.0		72.7	2.52	
Zone E						
Float at 2.95	3.5	89.7		83.4	2.18	
Sink at 2.95	0.4	10.3		67.2	36.6	
Composite	3.9	100.0		81.7	5.73	
Composite of Zones A, B, C	78.7			7.17	1.73	
Composite of 1.60 Float Fractions	78.6			7.12	1.72	
Composite of 2.95 Sink Fractions	0.65			67.9	35.0	
Composite of Table Products	100.0			21.5	2.02	
Analysis of Feed to Table				25.3	1.96	

Table A75

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table No. 15-S Tests - Pyrite Beneficiation

Coal Identification Clements Seam, Walker County, Alabama

Zone E, 3/8 Inch x 0 Run (2-23-72) Crushed to 30 Mesh x 0

BCR Sample No. 2928

Table Products	Product, Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
		Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	4.6	0.56	78.5	3.21	
Zone B	10.2	0.64	79.2	3.16	
Zone C	7.1	0.70	79.2	3.64	
Zone D	74.4	0.66	84.4	4.06	
Zone E	3.7	0.12	70.4	40.8	
Composite of Table Products	100.0		82.7	5.26	
Analysis of Feed to Table		1.28	83.0	5.26	

Run Date: 3-2-72

Table A76

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Concentrating Table No. 15-S Tests - Pyrite Beneficiation

Coal Identification Clements Seam, Walker County, Alabama

Zone D, 30 Mesh x 0 Run (3-2-72) Crushed to 60 Mesh x 0

BCR Sample No. 2928

Table Products	Product, Weight Percent	Chemical Analysis, Dry Basis, Weight Percent			
		Moisture	Ash	Total Sulfur	Ultimate Carbon
Zone A	3.1	0.59	83.8	2.97	
Zone B	36.5	0.37	84.0	2.72	
Zone C	27.4	0.34	83.9	3.09	
Zone D	29.0	0.26	85.5	4.10	
Zone E	4.0	0.10	69.4	42.0	
Composite of Table Products	100.0		83.8	4.80	
Analysis of Feed to Table		0.44	83.8	5.16	

Run Date: 3-8-72

Table A77

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Pyrite Beneficiation - Effects of Two-stage Cleaning

Coal Identification Clements Seam, Walker County, Alabama

BCR Sample No. 2928

Pyrite Precleaning

Concentrating Table No. 14 Test Run Date 2-23-72

Feed to Concentrating Table: Raw Run-of-Mine Coal Crushed to 3/8 Inch x 0

	Product, Weight %	Chemical Analysis, Dry Basis, Weight %	
		Ash	Total Sulfur
Analysis of Feed to Table		25.3	1.96
Zone E (Pyrite Zone)	3.5	68.5	35.8

Pyrite Cleaning

Concentrating Table No. 15-S Test Run Date 3-2-72

Feed to Concentrating Table: Zone E, 3/8 Inch x 0 Run (2-23-72) Crushed to 30 Mesh x 0

	Product, Weight %	Chemical Analysis, Dry Basis, Weight %	
		Ash	Total Sulfur
Analysis of Feed to Table		83.0	5.26
Zone E (Pyrite Zone)	3.7	70.4	40.8

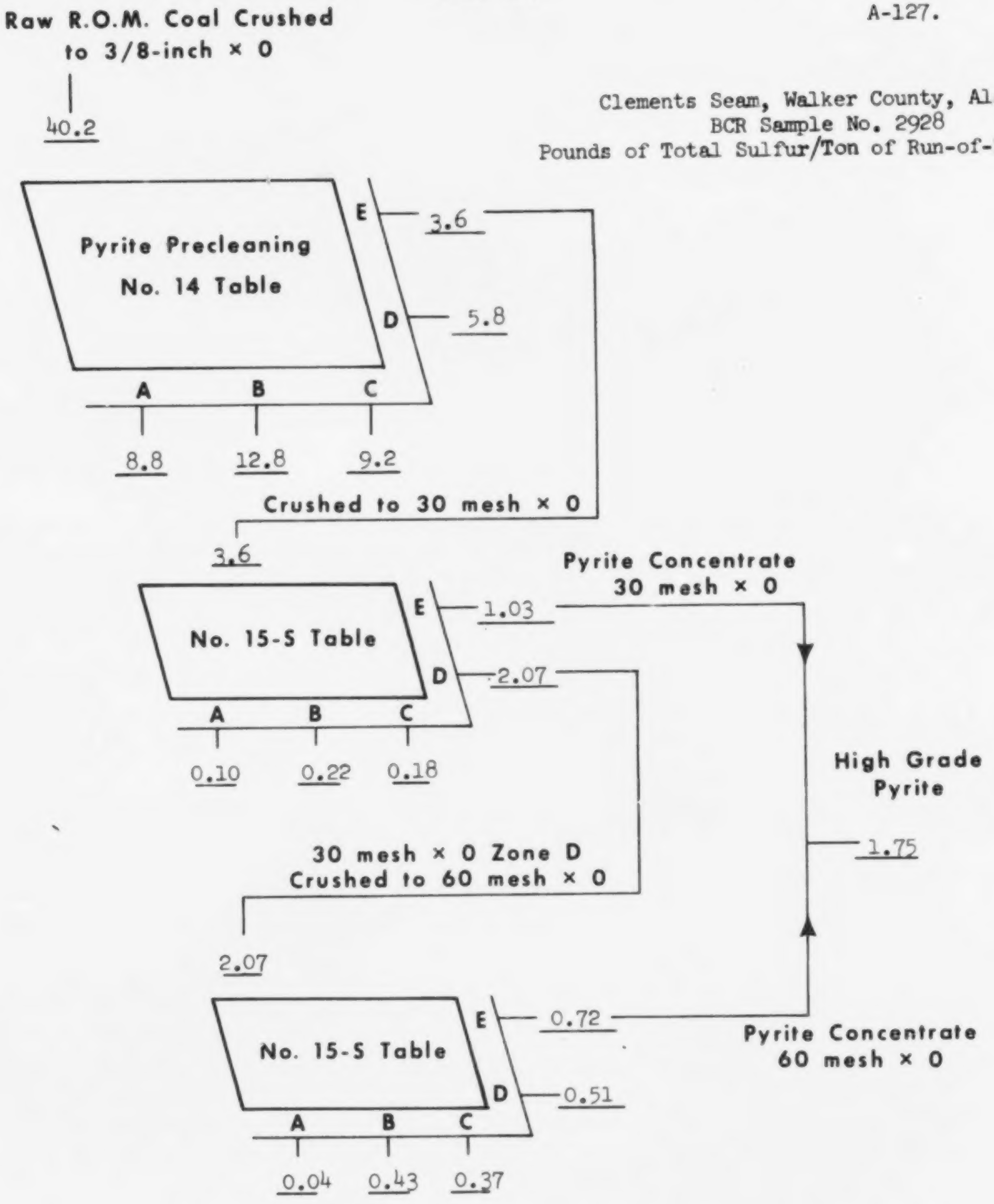
Concentrating Table No. 15-S Test Run Date 3-8-72

Feed to Concentrating Table: Zone D, 30 Mesh x 0 Run (3-2-72) Crushed to 60 Mesh x 0

	Product, Weight %	Chemical Analysis, Dry Basis, Weight %	
		Ash	Total Sulfur
Analysis of Feed to Table		83.8	5.16
Zone E (Pyrite Zone)	4.0	69.4	42.0
Two Stage Pyrite Product	0.24	69.9	41.3

Table A78

Clements Seam, Walker County, Alabama
BCR Sample No. 2928
Pounds of Total Sulfur/Ton of Run-of-Mine Coal


Raw R.O.M. Coal Crushed to 3/8-inch × 0
40.2
Pyrite Precleaning No. 14 Table
E
3.6
D
5.8
A
B
C
8.8
12.8
9.2
Crushed to 30 mesh × 0
3.6
Pyrite Concentrate 30 mesh × 0
No. 15-S Table
E
1.03
D
2.07
A
B
C
0.10
0.22
0.18
High Grade Pyrite
1.75
30 mesh × 0 Zone D Crushed to 60 mesh × 0
2.07
No. 15-S Table
E
0.72
Pyrite Concentrate 60 mesh × 0
D
0.51
A
B
C
0.04
0.43
0.37

Flowsheet for Pyrite Benefication Tests

Table A79

Evaluation of Coal Cleaning Processes and Techniques for Removing Pyritic Sulfur from Fine Coal

Flowsheet Data for Pyrite Beneficiation Tests

Coal Identification Clements Seam, Walker County, Alabama

BCR Sample No. 2928

Fraction	Weight Percent		Chemical Analysis, Dry Basis Weight Percent	
			Ash	Total Sulfur
Table No. 14				
Zone A	31.5		9.99	1.40
Zone B	34.0		8.02	1.88
Zone C	16.2		22.2	2.83
Zone D	14.8		79.1	1.97
Zone E		3.5	83.3	5.07
Table No. 15-S (30 Mesh x 0)				
Zone A	0.16		78.5	3.21
Zone B	0.36		79.2	3.16
Zone C	0.25		79.2	3.64
Zone D		2.60	84.4	4.06
Zone E	0.13		70.4	40.8
Table No. 15-S (60 Mesh x 0)				
Zone A	0.08		83.8	2.97
Zone B	0.95		84.0	2.72
Zone C	0.71		83.9	3.09
Zone D	0.75		85.5	4.10
Zone E	0.11		69.4	42.0
Composite of Fractions	100.0		24.1	2.04
Analysis of Feed Coal			25.3	1.96

Table A80

Evaluation of Coal Cleaning Processes and
for Removing Pyritic Sulfur from Fin

Concentrating Table Tests--3/8 Inch x 0 Rou

Ash Characteristics

Coal Identification Clements Seam, Walker County, Alabama

Raw Run-of-Mine Coal Crushed to 3/8 Inch x

Table Products	Product Weight Percent	Float and Sink Weight %	Chemical Analysis, Dry Basis, Weight Percent							Reducing At	
			Moisture	Ash	Total Sulfur	Sulfate Sulfur	Pyritic Sulfur	Organic Sulfur	Btu/lb	IDT	ST,S
Zone A	31.5		0.56	9.99	1.40		0.74	0.66	13,659	2620	2705
Zone B	34.0		0.52	8.02	1.88		1.15	0.73	13,946	2245	2520
Zone C			0.48	20.4	2.90		2.24	0.66	11,838	2530	2625
1.60 Float	12.7	78.2	0.61	11.4	2.81		1.91	0.90	13,376	2100	2515
1.60 by 1.90	1.6	10.0	0.68	41.2	3.83		3.32	0.51	8,262	2710	2750+
1.90 Sink	1.9	11.8	0.68	77.3	2.10	0.03	1.91	0.16	2,207	2740	2750+
Composite	16.2	100.0		22.2	2.83	0.00	2.05	0.77	11,547		
Zone D			0.74	79.4	2.08		1.95	0.13	1,770	2750+	2750+
1.90 Float	1.1	7.3	0.78	28.3	3.53		2.89	0.64	10,504	2570	2660
1.90 by 2.95	13.5	91.6	0.67	83.3	1.50		1.42	0.08	1,167	2750+	2750+
2.95 Sink	0.2	1.1	0.37	70.3	30.6	0.18	30.0	0.47	3,336	2035	2050
Composite	14.8	100.0		79.1	1.97	0.00	1.84	0.13	1,872		
Zone E			0.54	83.4	4.90	0.08	4.70	0.12	1,100	2640	2750
2.95 Float	3.2	90.5	1.04	84.9	1.84	0.02	1.73	0.09	888	2745	2750+
2.95 Sink	0.3	9.5	0.20	68.5	35.8	0.13	34.3	1.33	2,876	2320	2420
Composite	3.5	100.0		83.3	5.07	0.03	4.82	0.21	1,077		
Composite of Table Products	100.0			24.1	2.01	0.00	1.40	0.61	11,230		
Analysis of Feed to Table			0.52	25.3	1.96		1.42	0.54	11,044	2700	2750+

Run Date: 2-23-72

IDT -
ST,S -
ST,H -
FT -

A80

ng Processes and Techniques
Sulfur from Fine Coal

3/8 Inch x 0 Rough Cleaning

teristics

Y, Alabama

d to 3/8 Inch x 0

BCR Sample No. 2928

	Ash Fusibility								Ash Spectrography							
	Reducing Atmosphere				Oxidizing Atmosphere											
b	IDT	ST,S	ST,H	FT	IDT	ST,S	ST,H	FT	SiO_2	Al_2O_3	Fe_2O_3	MgO	CaO	TiO_2	Na_2O	K_2O
69	2620	2705		2750+	2750+	2750+		2750+	51.0	30.3	10.2	0.97	1.86	1.18	0.57	2.0
6	2245	2520		2700	2695	2740		2750+	44.5	29.3	17.5	0.90	2.30	1.10	0.70	1.8
8	2530	2625		2750+	2750+	2750+		2750+	49.0	28.7	14.1	0.97	1.05	1.11	0.31	2.7
6	2100	2515		2620	2645	2700		2750+	40.0	28.9	24.5	0.75	1.30	1.16	0.42	2.4
2	2710	2750+		2750+	2750+	2750+		2750+	49.0	32.0	12.3	1.06	0.45	1.16	0.23	3.2
7	2740	2750+		2750+	2750+	2750+		2750+	57.0	30.8	4.40	1.01	0.49	1.31	0.28	3.1
7																
0	2750+	2750+		2750+	2750+	2750+		2750+	56.5	31.3	4.40	0.78	0.66	1.26	0.25	2.2
	2570	2660		2750+	2750+	2750+		2750+	46.5	29.6	15.2	0.90	0.95	1.15	0.31	2.9
7	2750+	2750+		2750+	2750+	2750+		2750+	59.0	31.6	3.75	0.77	0.52	1.40	0.20	1.3
5	2035	2050		2180	2590	2700		2750+	20.0	13.2	63.0*	0.27	0.60	0.67	0.13	1.2
2																
0	2640	2750		2750+	2750+	2750+		2750+	55.5	29.7	9.80	0.78	0.64	1.22	0.21	2.2
3	2745	2750+		2750+	2750+	2750+		2750+	59.0	31.2	4.40	0.85	0.60	1.31	0.21	1.9
5	2320	2420		2500	2750+	2750+		2750+	8.50*	7.30*	82.0*	0.20	0.38	0.30	0.05	0.4
7																
0																
4	2700	2750+		2750+	2750+	2750+		2750+	55.0	30.5	7.70	0.82	0.96	1.26	0.31	2.1

IDT - Initial Deformation Temperature
ST,S - Softening Temperature, Spherical
ST,H - Softening Temperature, Hemispherical
FT - Fluid Temperature

* Extrapolated values

Appendix B

FUEL AND PYRITE CONCENTRATE EVALUATIONS

Tables	Seam	BCR Lot No.
B1 - B4	Western Ky. No. 6	2847
B5 - B8	Bakerstown	2856
B9 - B12	L. Kittanning	2860
B13 - B16	L. Freeport	2881
B17 - B20	Ft. Scott	2889
B21 - B24	L. Freeport	2900
B25 - B28	Baxter	2926
B29 - B32	Clements	2928

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TABLE B-1. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING DIRECT TWO-SPLIT SEPARATION

Coal Identification: W. Kentucky No. 6 Seam, Butler County, Ky.

BCR Lot No. 2847

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value
		Ash	Total Sulfur	Calorific Value Btu/lb	
Zone A (assumed 1.60 Fl.)	26.9	5.98	3.47	13,685	
Zone B (assumed 1.60 Fl.)	43.2	4.88	3.53	13,896	
Zone C, 1.60 Fl.	23.7	5.52	3.98	13,725	
Zone C, 1.60 x 1.90	0.8	29.20	10.90	9,592	
Zone C, 1.90 Sk.	1.4	64.80	17.40	4,104	
Composite of Fractions	96.0	6.42	3.89	13,616	99.0
Refuse					
Zone D, 1.90 Fl.	0.2	15.4	9.32	11,956	
Zone D, 1.90 x 2.95	0.7	67.2	15.60	3,651	
Zone D, 2.95 Sk.	0.9	62.9	43.40	2,510	
Zone E, 2.95 Fl.	0.5	61.8	14.60	4,692	
Zone E, 2.95 Sk.	1.7	63.6	44.60	2,460	
Composite of Fractions	4.0	61.44	33.74	3,433	1.0
Composite of Table Fractions	100.0	8.62	5.08	13,209	

TABLE B-2. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING CONVENTIONAL TWO-SPLIT SEPARATION

Coal Identification: W. Kentucky No. 6 Seam, Butler County, Ky.

BCR Lot No. 2847

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value
		Ash	Total Sulfur	Calorific Value Btu/lb	
Zone A (assumed 1.60 Fl.)	26.9	5.98	3.47	13,685	
Zone B (assumed 1.60 Fl.)	43.2	4.88	3.53	13,896	
Zone C, 1.60 Fl.	23.7	5.52	3.98	13,725	
Composite of Fractions	93.8	5.36	3.63	13,792	97.9
Refuse					
Zone C, 1.60 x 1.90	0.8	29.20	10.90	9,592	
Zone C, 1.90 Sk.	1.4	64.80	17.40	4,104	
Zone D, 1.90 Fl.	0.2	15.40	9.32	11,956	
Zone D, 1.90 x 2.95	0.7	67.20	15.60	3,651	
Zone D, 2.95 Sk.	0.9	62.90	43.40	2,510	
Zone E, 2.95 Fl.	0.5	61.80	14.60	4,692	
Zone E, 2.95 Sk	1.7	63.60	44.60	2,460	
Composite of Fractions	6.2	58.04	27.10	4,380	2.1
Composite of Table Fractions	100.0	8.63	5.09	13,208	

TABLE B-3. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING CONVENTIONAL THREE-SPLIT SEPARATION

Coal Identification: W. Kentucky No. 6 Seam, Butler County, Ky.

BCR Lot No. 2847

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis: Ash	Total Sulfur	Calorific Value Btu/lb	Composite Wt. % of Available Calorific Value	% of Total Usable Product
Zone A (assumed 1.60 Fl.)	26.9	5.98	3.47	13,685		
Zone B (assumed 1.60 Fl.)	43.2	4.88	3.53	13,896		
Zone C, 1.60 Fl.	23.7	5.52	3.98	13,725		
Composite of Fractions	93.8	5.36	3.63	13,792	97.9	94.9
High Sulfur Combustor Feedstock						
Zone C, 1.60 x 1.90	0.8	29.20	10.90	9,592		
Zone C, 1.90 Sk.	1.4	64.80	17.40	4,104		
Zone D, 1.90 Fl.	0.2	15.40	9.32	11,956		
Zone D, 2.95 Sk.	0.9	62.90	43.40	2,510		
Zone E, 2.95 Sk.	1.7	63.60	44.60	2,460		
Composite of Fractions	5.0	56.38	29.96	4,450	1.7	5.1
Refuse						
Zone D, 1.90 x 2.95	0.7	67.20	15.60	3,651		
Zone E, 2.95 Fl.	0.5	61.80	14.60	4,692		
Composite of Fractions	1.2	64.95	15.18	4,085	0.4	-
Composite of Table Fractions	100.0	8.63	5.09	13,208		

TABLE B-4. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING "UNCONVENTIONAL" THREE-SPLIT SEPARATION

Coal Identification: W. Kentucky No. 6 Seam, Butler County, Ky.

BCR Lot No. 2847

	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value	% of Total Usable Product
Low Sulfur Combustor Feedstock		Ash	Total Sulfur	Calorific Value Btu/lb		
Zone A (assumed 1.60 Fl.)	26.9	5.98	3.47	13,685		
Zone B (assumed 1.60 Fl.)	43.2	4.88	3.53	13,896		
Composite of Fractions	70.1	5.30	3.51	13,815	73.3	71.0
High Sulfur Combustor Feedstock						
Zone C, 1.60 Fl.	23.7	5.52	3.98	13,725		
Zone C, 1.60 x 1.90	0.8	29.20	10.90	9,592		
Zone C, 1.90 Sk.	1.4	64.80	17.40	4,104		
Zone D, 1.90 Fl.	0.2	15.40	9.32	11,956		
Zone D, 2.95 Sk.	0.9	62.90	43.40	2,510		
Zone E, 2.95 Sk.	1.7	63.60	44.60	2,460		
Composite of Fractions	28.7	14.38	8.51	12,109	26.3	29.0
Refuse						
Zone D, 1.90 x 2.95	0.7	67.20	15.60	3,651		
Zone E, 2.95 Fl.	0.5	61.80	14.60	4,692		
Composite of Fractions	1.2	64.95	15.18	4,085	0.4	-
Composite of Table Fractions	100.0	8.62	5.09	13,209		

TABLE B-5. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING DIRECT TWO-SPLIT SEPARATION

Coal Identification: Bakerstown, Grant County, West Virginia

BCR Lot No. 2856

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis: Ash	Chemical Analysis, Weight Percent, Dry Basis: Total Sulfur	Chemical Analysis, Weight Percent, Dry Basis: Calorific Value Btu/lb	Composite Wt. % of Available Calorific Value
Zone A (assumed 1.60 Fl.)	47.3	10.2	1.23	14,014	
Zone B (assumed 1.60 Fl.)	22.0	13.0	1.24	13,490	
Zone C, 1.60 Fl.	6.0	15.8	1.35	12,921	
Zone C, 1.60 x 1.90	6.6	45.2	2.02	7,891	
Zone C, 1.90 Sk.	2.6	60.5	5.22	5,144	
Composite of Fractions	84.5	15.6	1.42	13,052	95.2
Refuse					
Zone D, 1.90 Fl.	2.1	36.2	1.86	9,426	
Zone D, 1.90 x 2.95	8.6	77.8	4.89	2,354	
Zone D, 2.95 Sk.	1.4	61.0	38.60	3,870	
Zone E, 2.95 Fl.	1.3	79.2	6.34	2,067	
Zone E, 2.95 Sk.	2.1	62.0	40.50	3,565	
Composite of Fractions	15.5	68.5	12.38	3,582	4.8
Composite of Table Fractions	100.0	23.8	3.12	11,584	

TABLE B-6. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING CONVENTIONAL TWO-SPLIT SEPARATION

Coal Identification: Bakerstown, Grant County, West Virginia

BCR Lot No. 2856

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value
		Ash	Total Sulfur	Calorific Value Btu/lb	
Zone A (assumed 1.60 Fl.)	47.3	10.2	1.23	14,014	
Zone B (assumed 1.60 Fl.)	22.0	13.0	1.24	13,490	
Zone C, 1.60 Fl.	6.0	15.8	1.35	12,921	
Composite of Fractions	75.3	11.5	1.24	13,774	89.5
Refuse					
Zone C, 1.60 x 1.90	6.6	45.2	2.02	7,891	
Zone C, 1.90 Sk.	2.6	60.5	5.22	5,144	
Zone D, 1.90 Fl.	2.1	36.2	1.86	9,426	
Zone D, 1.90 x 2.95	8.6	77.8	4.89	2,354	
Zone D, 2.95 Sk.	1.4	61.0	38.60	3,870	
Zone E, 2.95 Fl.	1.3	79.2	6.34	2,067	
Zone E, 2.95 Sk.	2.1	62.0	40.50	3,565	
Composite of Fractions	24.7	61.5	8.91	4,902	10.5
Composite of Table Fractions	100.0	23.8^{+}	3.12	11,584	

TABLE B-7. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING CONVENTIONAL THREE-SPLIT SEPARATION

Coal Identification: Bakerstown, Grant County, West Virginia

BCR Lot No. 2856

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value	% of Total Usable Product
		Ash	Total Sulfur	Calorific Value Btu/lb		
Zone A (assumed 1.60 Fl.)	47.3	10.2	1.23	14,014		
Zone B (assumed 1.60 Fl.)	22.0	13.0	1.24	13,490		
Zone C, 1.60 Fl.	6.0	15.8	1.35	12,921		
Composite of Fractions	75.3	11.5	1.24	13,774	89.5	83.6
High Sulfur Combustor Feedstock						
Zone C, 1.60 x 1.90	6.6	45.2	2.02	7,891		
Zone C, 1.90 Sk.	2.6	60.5	5.22	5,144		
Zone D, 1.90 Fl.	2.1	36.2	1.86	9,426		
Zone D, 2.95 Sk.	1.4	61.0	38.60	3,870		
Zone E, 2.95 Sk.	2.1	62.0	40.50	3,565		
Composite of Fractions	14.8	50.5	11.48	6,632	8.5	16.4
Refuse						
Zone D, 1.90 x 2.95	8.6	77.8	4.89	2,354		
Zone E, 2.95 Fl.	1.3	79.2	6.34	2,067		
Composite of Fractions	9.9	78.0	5.08	2,316	2.0	-
Composite of Table Fractions	100.0	23.8	3.14	11,583		

TABLE B-8. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING "UNCONVENTIONAL" THREE-SPLIT SEPARATION

Coal Identification: Bakerstown, Grant County, West Virginia

BCR Lot No. 2856

		Chemical Analysis, Weight Percent, Dry Basis				
Low Sulfur Combustor Feedstock	Product, Weight Percent	Ash	Total Sulfur	Calorific Value Btu/lb	Composite Wt. % of Available Calorific Value	% of Total Usable Product
Zone A (assumed 1.60 Fl.)	47.3	10.2	1.23	14,014		
Zone B (assumed 1.60 Fl.)	22.0	13.0	1.24	13,490		
Composite of Fractions	69.3	11.1	1.23	13,848	82.8[+]	76.9
High Sulfur Combustor Feedstock						
Zone C, 1.60 Fl.	6.0	15.8	1.35	12,921		
Zone C, 1.60 x 1.90	6.6	45.2	2.02	7,891		
Zone C, 1.90 Sk.	2.6	60.5	5.22	5,144		
Zone D, 1.90 Fl.	2.1	36.2	1.86	9,426		
Zone D, 2.95 Sk.	1.4	61.0	38.60	3,870		
Zone E, 2.95 Sk.	2.1	62.0	40.50	3,565		
Composite of Fractions	20.8	40.5	8.56	8,446	15.2	23.1
Refuse						
Zone D, 1.90 x 2.95	8.6	77.8	4.89	2,354		
Zone E, 2.95 Fl.	1.3	79.2	6.34	2,067		
Composite of Fractions	9.9	78.0	5.08	2,316	2.0	-
Composite of Table Fractions	100.0	23.8	3.14	11,583		

TABLE B-9. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING DIRECT TWO-SPLIT SEPARATION

Coal Identification: Lower Kittanning, Westmoreland County, Pa.

BCR Lot No. 2860

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value
		Ash	Total Sulfur	Calorific Value Btu/lb	
Zone A (assumed 1.60 Fl.)	45.9	8.26	1.90	14,428	
Zone B (assumed 1.60 Fl.)	17.5	8.10	2.09	14,408	
Zone C, 1.60 Fl.	4.1	11.00	3.00	13,776	
Zone C, 1.60 x 1.90	1.7	31.20	8.42	9,912	
Zone C, 1.90 Sk.	2.6	62.80	9.46	4,186	
Composite of Fractions	71.8	10.90	2.44	13,908	94.2
Refuse					
Zone D, 1.90 Fl.	0.5	27.80	6.87	10,604	
Zone D, 1.90 x 2.95	11.4	78.60	5.07	1,944	
Zone D, 2.95 Sk.	0.2	67.00	29.10	3,284	
Zone E, 2.95 Fl.	12.3	81.00	5.18	1,666	
Zone E, 2.95 Sk.	3.8	65.40	36.40	3,428	
Composite of Fractions	28.2	76.89	9.54	2,186	5.8
Composite of Table Fractions	100.0	29.5	4.44	10,602	

TABLE B-10. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING CONVENTIONAL TWO-SPLIT SEPARATION

Coal Identification: Lower Kittanning, Westmoreland County, Pa.

BCR Lot No. 2860

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value
		Ash	Total Sulfur	Calorific Value Btu/lb	
Zone A (assumed 1.60 Fl.)	45.9	8.26	1.90	14,428	
Zone B (assumed 1.60 Fl.)	17.5	8.10	2.09	14,408	
Zone C, 1.60 Fl.	4.1	11.00	3.00	13,776	
Composite of Fractions	67.5	8.38	2.02	14,383	91.6
Refuse					
Zone C, 1.60 x 1.90	1.7	31.20	8.42	9,912	
Zone C, 1.90 Sk.	2.6	62.80	9.46	4,186	
Zone D, 1.90 Fl.	0.5	27.80	6.87	10,604	
Zone D, 1.90 x 2.95	11.4	78.60	5.07	1,944	
Zone D, 2.95 Sk.	0.2	67.00	29.10	3,284	
Zone E, 2.95 Fl.	12.3	81.00	5.18	1,666	
Zone E, 2.95 Sk.	3.8	65.40	36.40	3,428	
Composite of Fractions	32.5	73.37	9.48	2,750	8.4
Composite of Table Fractions	100.0	29.5	4.44	10,602	

TABLE B-11. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS
USING CONVENTIONAL THREE-SPLIT SEPARATION

Coal Identification: Lower Kittanning, Westmoreland County, Pa.

BCR Lot No. 2860

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value	% of Total Usable Product
		Ash	Total Sulfur	Calorific Value Btu/lb		
Zone A (assumed 1.60 Fl.)	45.9	8.26	1.90	14,428		
Zone B (assumed 1.60 Fl.)	17.5	8.10	2.09	14,408		
Zone C, 1.60 Fl.	4.1	11.00	3.00	13,776		
Composite of Fractions	67.5	8.38^{+}	2.02	14,383	91.6	88.5
High Sulfur Combustor Feedstock						
Zone C, 1.60 x 1.90	1.7	31.2	8.42	9,912		
Zone C, 1.90 Sk.	2.6	62.8	9.46	4,186		
Zone D, 1.90 Fl.	0.5	27.8	6.87	10,604		
Zone D, 2.95 Sk.	0.2	67.0	29.10	3,284		
Zone E, 2.95 Sk.	3.8	65.4	36.40	3,428		
Composite of Fractions	8.8	55.90	21.19	5,309	4.4	11.5
Refuse						
Zone D, 1.90 x 2.95	11.4	78.6	5.07	1,944		
Zone E, 2.95 Fl.	12.3	81.0	5.18	1,666		
Composite of Fractions	23.7	79.84	5.13	1,800	4.0	-
Composite of Table Fractions	100.0	29.5	4.44	10,602		

TABLE B-12. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING "UNCONVENTIONAL" THREE-SPLIT SEPARATION

Coal Identification: Lower Kittanning, Westmoreland County, Pa.

BCR Lot No. 2860

	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value	% of Total Usable Product
Low Sulfur Combustor Feedstock		Ash	Total Sulfur	Calorific Value Btu/lb		
Zone A (assumed 1.60 Fl.)	45.9	8.26	1.90	14,428		
Zone B (assumed 1.60 Fl.)	17.5	8.10	2.09	14,408		
Composite of Fractions	63.4	8.22	1.95	14,423	86.3	83.1
High Sulfur Combustor Feedstock						
Zone C, 1.60 Fl.	4.1	11.0	3.00	13,776		
Zone C, 1.60 x 1.90	1.7	31.2	8.42	9,912		
Zone C, 1.90 Sk.	2.6	62.8	9.46	4,186		
Zone D, 1.90 Fl.	0.5	27.8	6.87	10,604		
Zone D, 2.95 Sk.	0.2	67.0	29.10	3,284		
Zone E, 2.95 Sk.	3.8	65.4	36.40	3,428		
Composite of Fractions	12.9	41.65	15.41	8,000	9.7	16.9
Refuse						
Zone D, 1.90 x 2.95	11.4	78.6	5.07	1,944		
Zone E, 2.95 Fl.	12.3	81.0	5.18	1,666		
Composite of Fractions	23.7	79.85	5.13	1,800	4.0	-
Composite of Table Fractions	100.0	29.5	4.44	10,603		

TABLE B-13. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING DIRECT TWO-SPLIT SEPARATION

Coal Identification: Lower Freeport, Indiana County, Pa.

BCR Lot No. 2881

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value
		Ash	Total Sulfur	Calorific Value Btu/lb	
Zone A (assumed 1.60 Fl.)	46.6	8.21	1.28	14,231	
Zone B (assumed 1.60 Fl.)	18.2	8.35	1.36	14,230	
Zone C, 1.60 Fl.	9.8	10.80	1.44	13,824	
Zone C, 1.60 x 1.90	5.5	46.10	1.94	7,785	
Zone C, 1.90 Sk.	4.4	66.40	2.88	4,388	
Composite of Fractions	84.5	14.04	1.44	13,251	96.4
Refuse					
Zone D, 1.90 Fl.	1.4	37.60	2.06	9,271	
Zone D, 1.90 x 2.95	9.2	80.60	2.62	1,997	
Zone D, 2.95 Sk.	0.3	62.40	36.80	3,769	
Zone E, 2.95 Fl.	3.9	82.20	3.14	1,726	
Zone E, 2.95 Sk.	0.7	61.80	40.80	4,392	
Composite of Fractions	15.5	75.92	5.09	2,728	3.6
Composite of Table Fractions	100.0	23.6	2.01	11,620	

TABLE B-14. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS
USING CONVENTIONAL TWO-SPLIT SEPARATION

Coal Identification: Lower Freeport, Indiana County, Pa.

BCR Lot No. 2881

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value
		Ash	Total Sulfur	Calorific Value Btu/lb	
Zone A (assumed 1.60 Fl.)	46.6	8.21	1.28	14,231	
Zone B (assumed 1.60 Fl.)	18.2	8.35	1.36	14,230	
Zone C, 1.60 Fl.	9.8	10.80	1.44	13,824	
Composite of Fractions	74.6	8.58$^+$	1.32	14,177	91.0
Refuse					
Zone C, 1.60 x 1.90	5.5	46.10	1.94	7,785	
Zone C, 1.90 Sk.	4.4	66.40	2.88	4,388	
Zone D, 1.90 Fl.	1.4	37.60	2.06	9,271	
Zone D, 1.90 x 2.95	9.2	80.60	2.62	1,997	
Zone E, 2.95 Fl.	0.3	62.40	36.80	3,769	
Zone E, 2.95 Sk.	3.9	82.20	3.14	1,726	
Zone E, 2.95 Sk.	0.7	61.80	40.80	4,392	
Composite of Fractions	25.4	67.81	4.02	4,111	9.0
Composite of Table Fractions	100.0	23.6	2.01	11,620	

TABLE B-15. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING CONVENTIONAL THREE-SPLIT SEPARATION

Coal Identification: Lower Freeport, Indiana County, Penna.

BCR Lot No. 2881

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis: Ash	Total Sulfur	Calorific Value Btu/lb	Composite Wt. % of Available Calorific Value	% of Total Usable Product
Zone A (assumed 1.60 Fl.)	46.6	8.21	1.28	14,231		
Zone B (assumed 1.60 Fl.)	18.2	8.35	1.36	14,230		
Zone C, 1.60 Fl.	9.8	10.80	1.44	13,824		
Composite of Fractions	74.6	8.58+	1.32	14,177	91.0	85.8
High Sulfur Combustor Feedstock						
Zone C, 1.60 x 1.90	5.5	46.10	1.94	7,785		
Zone C, 1.90 Sk.	4.4	66.40	2.88	4,388		
Zone D, 1.90 Fl.	1.4	37.60	2.06	9,271		
Zone D, 2.95 Sk.	0.3	62.40	36.80	3,769		
Zone E, 2.95 Sk.	0.7	61.80	40.80	4,392		
Composite of Fractions	12.3	53.69	5.35	6,448	6.8	14.2
Refuse						
Zone D, 1.90 x 2.95	9.2	80.60	2.62	1,997		
Zone E, 2.95 Fl.	3.9	82.20	3.14	1,726		
Composite of Fractions	13.1	81.08	2.77+	1,916	2.2	-
Composite of Table Fractions	100.0	23.6	2.01	11,620		

TABLE B-16. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS
USING "UNCONVENTIONAL" THREE-SPLIT SEPARATION

Coal Identification: Lower Freeport, Indiana County, Penna.

BCR Lot No. 2881

	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value	% of Total Usable Product
Low Sulfur Combustor Feedstock		Ash	Total Sulfur	Calorific Value Btu/lb		
Zone A (assumed 1.60 Fl.)	46.6	8.21	1.28	14,231		
Zone B (assumed 1.60 Fl.)	18.2	8.35	1.36	14,230		
Composite of Fractions	64.8	8.25	1.30	14,231	79.3	74.6
High Sulfur Combustor Feedstock						
Zone C, 1.60 Fl.	9.8	10.80	1.44	13,824		
Zone C, 1.60 x 1.90	5.5	46.10	1.94	7,785		
Zone C, 1.90 Sk.	4.4	66.40	2.88	4,388		
Zone D, 1.90 Fl.	1.4	37.60	2.06	9,271		
Zone D, 2.95 Sk.	0.3	62.40	36.80	3,769		
Zone E, 2.95 Sk.	0.7	61.80	40.80	4,392		
Composite of Fractions	22.1	34.67	3.62	9,719	18.5	25.4
Refuse						
Zone D, 1.90 x 2.95	9.2	80.60	2.62	1,997		
Zone E, 2.95 Fl.	3.9	82.20	3.14	1,726		
Composite of Fractions	13.1	81.08	2.77	1,916	2.2	-
Composite of Table Fractions	100.0	23.6	2.01	11,621		

TABLE B-17. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING DIRECT TWO-SPLIT SEPARATION

Coal Identification: Fort Scott, Rogers County, Oklahoma

BCR Lot No. 2889

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis: Ash	Total Sulfur	Calorific Value Btu/lb	Composite Wt. % of Available Calorific Value
Zone A (assumed 1.60 Fl.)	43.0	6.51	3.44	13,962	
Zone B (assumed 1.60 Fl.)	39.2	5.12	3.58	14,144	
Zone C, 1.60 Fl.	7.0	8.85	5.30	13,482	
Zone C, 1.60 x 1.90	1.3	34.70	7.02	8,718	
Zone C, 1.90 Sk.	2.5	71.40	5.20	2,532	
Composite of Fractions	93.0	8.24	3.74	13,622	98.7
Refuse					
Zone D, 1.90 Fl.	0.6	15.40	5.12	12,549	
Zone D, 1.90 x 2.95	3.7	73.60	4.53	1,462	
Zone D, 2.95 Sk.	0.5	73.50	30.20	1,823	
Zone E, 2.95 Fl.	1.4	67.00	4.37	1,459	
Zone E, 2.95 Sk.	0.8	73.40	35.20	1,696	
Composite of Fractions	7.0	67.26	9.89	2,464	1.3
Composite of Table Fractions	100.0	12.37	4.17	12,841	

TABLE B-18. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING CONVENTIONAL TWO-SPLIT SEPARATION

Coal Identification: Fort Scott, Rogers County, Oklahoma

BCR Lot No. 2889

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis: Ash	Total Sulfur	Calorific Value Btu/lb	Composite Wt. % of Available Calorific Value
Zone A (assumed 1.60 Fl.)	43.0	6.51	3.44	13,962	
Zone B (assumed 1.60 Fl.)	39.2	5.12	3.58	14,144	
Zone C, 1.60 Fl.	7.0	8.85	5.30	13,482	
Composite of Fractions	89.2	6.08	3.65	14,004	97.3
Refuse					
Zone C, 1.60 x 1.90	1.3	34.70	7.02	8,718	
Zone C, 1.90 Sk.	2.5	71.40	5.20	2,532	
Zone D, 1.90 Fl.	0.6	15.40	5.12	12,549	
Zone D, 1.90 x 2.95	3.7	73.60	4.53	1,462	
Zone D, 2.95 Sk.	0.5	73.50	30.20	1,823	
Zone E, 2.95 Fl.	1.4	67.00	4.37	1,459	
Zone E, 2.95 Sk.	0.8	73.40	35.20	1,696	
Composite of Fractions	10.8	64.30	8.46	3,233	2.7
Composite of Table Fractions	100.0	12.37	4.17	12,841	

TABLE B-19. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING CONVENTIONAL THREE-SPLIT SEPARATION

Coal Identification: Fort Scott, Rogers County, Oklahoma

BCR Lot No. 2889

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value	% of Total Usable Product
		Ash	Total Sulfur	Calorific Value Btu/lb		
Zone A (assumed 1.60 Fl.)	43.0	6.51	3.44	13,962		
Zone B (assumed 1.60 Fl.)	39.2	5.12	3.58	14,144		
Zone C, 1.60 Fl.	7.0	8.85	5.30	13,482		
Composite of Fractions	89.2	6.08	3.65	14,004	97.3	94.0
High Sulfur Combustor Feedstock						
Zone C, 1.60 x 1.90	1.3	34.70	7.02	8,718		
Zone C, 1.90 Sk.	2.5	71.40	5.20	2,532		
Zone D, 1.90 Fl.	0.6	15.40	5.12	12,549		
Zone D, 2.95 Sk.	0.5	73.50	30.20	1,823		
Zone E, 2.95 Sk.	0.8	73.40	35.20	1,696		
Composite of Fractions	5.7	57.60	12.01	4,818	2.1	6.0
Refuse						
Zone D, 1.90 x 2.95	3.7	73.60	4.53	1,462		
Zone E, 2.95 Fl.	1.4	67.00	4.37	1,459		
Composite of Fractions	5.1	71.79	4.49	1,461	0.6	-
Composite of Table Fractions	100.0	12.37	4.17	12,841		

TABLE B-20. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING "UNCONVENTIONAL" THREE-SPLIT SEPARATION

Coal Identification: Fort Scott, Rogers' County, Oklahoma

BCR Lot No. 2889

	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value	% of Total Usable Product
Low Sulfur Combustor Feedstock		Ash	Total Sulfur	Calorific Value Btu/lb		
Zone A (assumed 1.60 Fl.)	43.0	6.51	3.44	13,962		
Zone B (assumed 1.60 Fl.)	39.2	5.12	3.58	14,144		
Composite of Fractions	82.2	5.85	3.51	14,049	89.9	86.6
High Sulfur Combustor Feedstock						
Zone C, 1.60 Fl.	7.0	8.85	5.30	13,482		
Zone C, 1.60 x 1.90	1.3	34.70	7.02	8,718		
Zone C, 1.90 Sk.	2.5	71.40	5.20	2,532		
Zone D, 1.90 Fl.	0.6	15.40	5.12	12,549		
Zone D, 2.95 Sk.	0.5	73.50	30.20	1,823		
Zone E, 2.95 Sk.	0.8	73.40	35.20	1,696		
Composite of Fractions	12.7	30.73	8.31	9,593	9.5	13.4
Refuse						
Zone D, 1.90 x 2.95	3.7	73.60	4.53	1,462		
Zone E, 2.95 Fl.	1.4	67.00	4.37	1,459		
Composite of Fractions	5.1	71.79	4.49	1,461	0.6	-
Composite of Table Fractions	100.0	12.37	4.17	12,841		

TABLE B-21. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING DIRECT TWO-SPLIT SEPARATION

Coal Identification: Lower Freeport, Butler County, Penna.

BCR Lot No. 2900

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value
		Ash	Total Sulfur	Calorific Value Btu/lb	
Zone A (assumed 1.60 Fl.)	43.9	11.7	2.20	13,073	
Zone B (assumed 1.60 Fl.)	42.3	11.8	2.22	13,092	
Zone C, 1.60 Fl.	5.8	15.8	3.16	12,377	
Zone C, 1.60 x 1.90	2.2	33.8	9.10	9,180	
Zone C, 1.90 Sk.	3.1	60.4	15.20	4,638	
Composite of Fractions	97.3	14.04	2.84	12,683	99.0
Refuse					
Zone D, 1.90 Fl.	0.3	18.8	4.41	11,874	
Zone D, 1.90 x 2.95	1.1	64.6	14.20	3,994	
Zone D, 2.95 Sk.	0.7	60.4	41.00	3,234	
Zone E, 2.95 Fl.	0.1	56.3	16.40	5,286	
Zone E, 2.95 Sk.	0.5	62.4	42.20	2,870	
Composite of Fractions	2.7	57.71	25.33	4,512	1.0
Composite of Table Fractions	100.0	15.22	3.45	12,462	

TABLE B-22. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING CONVENTIONAL TWO-SPLIT SEPARATION

Coal Identification: Lower Freeport, Butler County, Penna.

BCR Lot No. 2900

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value
		Ash	Total Sulfur	Calorific Value Btu/lb	
Zone A (assumed 1.60 Fl.)	43.9	11.7	2.20	13,073	
Zone B (assumed 1.60 Fl.)	42.3	11.8	2.22	13,092	
Zone C, 1.60 Fl.	5.8	15.8	3.16	12,377	
Composite of Fractions	92.0	12.00	2.27	13,038	96.2
Refuse					
Zone C, 1.60 x 1.90	2.2	33.8	9.10	9,180	
Zone C, 1.90 Sk.	3.1	60.4	15.20	4,638	
Zone D, 1.90 Fl.	0.3	18.8	4.41	11,874	
Zone D, 1.90 x 2.95	1.1	64.6	14.20	3,994	
Zone D, 2.95 Sk.	0.7	60.4	41.00	3,234	
Zone E, 2.95 Fl.	0.1	56.3	16.40	5,286	
Zone E, 2.95 Sk.	0.5	62.4	42.20	2,870	
Composite of Fractions	8.0	52.18	16.94	5,845	3.8
Composite of Table Fractions	100.0	15.21$^+$	3.44	12,463	

TABLE B-23. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING CONVENTIONAL THREE-SPLIT SEPARATION

Coal Identification: Lower Freeport, Butler County, Penna.

BCR Lot No. 2900

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value	% of Total Usable Product
		Ash	Total Sulfur	Calorific Value Btu/lb		
Zone A (assumed 1.60 Fl.)	43.9	11.7	2.20	13,073		
Zone B (assumed 1.60 Fl.)	42.3	11.8	2.22	13,092		
Zone C, 1.60 Fl.	5.8	15.8	3.16	12,377		
Composite of Fractions	92.0	12.00	2.27	13,038	96.2	93.1
High Sulfur Combustor Feedstock						
Zone C, 1.60 x 1.90	2.2	33.8	9.10	9,180		
Zone C, 1.90 Sk.	3.1	60.4	15.20	4,638		
Zone D, 1.90 Fl.	0.3	18.8	4.41	11,874		
Zone D, 2.95 Sk.	0.7	60.4	41.00	3,234		
Zone E, 2.95 Sk.	0.5	62.4	42.20	2,870		
Composite of Fractions	6.8	50.11	17.39	6,152	3.4	6.9
Refuse						
Zone D, 1.90 x 2.95	1.1	64.6	14.20	3,994		
Zone E, 2.95 Fl.	0.1	56.3	16.40	5,286		
Composite of Fractions	1.2	63.91	14.38	4,102	0.4	-
Composite of Table Fractions	100.0	15.21^{+}	3.44	12,463		

TABLE B-24. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING "UNCONVENTIONAL" THREE-SPLIT SEPARATION

Coal Identification: Lower Freeport, Butler County, Penna.

BCR Lot No. 2900

		Chemical Analysis, Weight Percent, Dry Basis				
Low Sulfur Combustor Feedstock	Product, Weight Percent	Ash	Total Sulfur	Calorific Value Btu/lb	Composite Wt. % of Available Calorific Value	% of Total Usable Product
Zone A (assumed 1.60 Fl.)	43.9	11.7	2.20	13,073		
Zone B (assumed 1.60 Fl.)	42.3	11.8	2.22	13,092		
Composite of Fractions	86.2	11.75	2.21	13,082	90.5	87.2
High Sulfur Combustor Feedstock						
Zone C, 1.60 Fl.	5.8	15.8	3.16	12,377		
Zone C, 1.60 x 1.90	2.2	33.8	9.10	9,180		
Zone C, 1.90 Sk.	3.1	60.4	15.20	4,638		
Zone D, 1.90 Fl.	0.3	18.8	4.41	11,874		
Zone D, 2.95 Sk.	0.7	60.4	41.00	3,234		
Zone E, 2.95 Sk.	0.5	62.4	42.20	2,870		
Composite of Fractions	12.6	34.31*	10.84	9,018	9.1	12.8
Refuse						
Zone D, 1.90 x 2.95	1.1	64.6	14.20	3,994		
Zone E, 2.95 Fl.	0.1	56.3	16.40	5,286		
Composite of Fractions	1.2	63.91	14.38	4,102	0.4	-
Composite of Table Fractions	100.0	15.22	3.44	12,462		

TABLE B-25. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING DIRECT TWO-SPLIT SEPARATION

Coal Identification: Baxter, Crawford County, Kansas

BCR Lot No. 2926

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value
		Ash	Total Sulfur	Calorific Value Btu/lb	
Zone A (assumed 1.60 Fl.)	27.2	10.50	2.92	13,544	
Zone B (assumed 1.60 Fl.)	46.0	9.66	3.06	13,689	
Zone C, 1.60 Fl.	18.9	11.00	3.71	13,410	
Zone C, 1.60 x 1.90	1.1	35.50	10.40	9,266	
Zone C, 1.90 Sk.	3.5	63.40	13.80	3,072	
Composite of Fractions	96.7	12.40	3.62	13,159	99.2
Refuse					
Zone D, 1.90 Fl.	0.4	14.60	4.40	12,877	
Zone D, 1.90 x 2.95	1.2	68.00	7.36	1,276	
Zone D, 2.95 Sk.	0.7	65.20	37.80	2,484	
Zone E, 2.95 Fl.	0.5	68.60	4.72	1,168	
Zone E, 2.95 Sk.	0.5	67.00	39.80	2,601	
Composite of Fractions	3.3	60.87	17.97	3,123	0.8
Composite of Table Fractions	100.0	14.00	4.09	12,828	

TABLE B-26. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING CONVENTIONAL TWO-SPLIT SEPARATION

Coal Identification: Baxter, Crawford County, Kansas

BCR Lot No. 2926

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis: Ash	Chemical Analysis, Weight Percent, Dry Basis: Total Sulfur	Chemical Analysis, Weight Percent, Dry Basis: Calorific Value Btu/lb	Composite Wt. % of Available Calorific Value
Zone A (assumed 1.60 Fl.)	27.2	10.50	2.92	13,544	
Zone B (assumed 1.60 Fl.)	46.0	9.66	3.06	13,689	
Zone C, 1.60 Fl.	18.9	11.00	3.71	13,410	
Composite of Fractions	92.1	10.18	3.15	13,589	97.6
Refuse					
Zone C, 1.60 x 1.90	1.1	35.5	10.40	9,266	
Zone C, 1.90 Sk.	3.5	63.4	13.80	3,072	
Zone D, 1.90 Fl.	0.4	14.6	4.40	12,877	
Zone D, 1.90 x 2.95	1.2	68.0	7.36	1,276	
Zone D, 2.95 Sk.	0.7	65.2	37.80	2,484	
Zone E, 2.95 Fl.	0.5	68.6	4.72	1,168	
Zone E, 2.95 Sk.	0.5	67.0	39.80	2,601	
Composite of Fractions	7.9	58.46	15.07	3,956	2.4
Composite of Table Fractions	100.0	13.99^+	4.09	12,828	

TABLE B-27. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING CONVENTIONAL THREE-SPLIT SEPARATION

Coal Identification: Baxter, Crawford County, Kansas

BCR Lot No. 2926

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value	% of Total Usable Product
		Ash	Total Sulfur	Calorific Value Btu/lb		
Zone A (assumed 1.60 Fl.)	27.2	10.50	2.92	13,544		
Zone B (assumed 1.60 Fl.)	46.0	9.66	3.06	13,689		
Zone C, 1.60 Fl.	18.9	11.00	3.71	13,410		
Composite of Fractions	92.1	10.18	3.15	13,589	97.5	93.7
High Sulfur Combustor Feedstock						
Zone C, 1.60 x 1.90	1.1	35.5	10.40	9,266		
Zone C, 1.90 Sk.	3.5	63.4	13.80	3,072		
Zone D, 1.90 Fl.	0.4	14.6	4.40	12,877		
Zone D, 2.95 Sk.	0.7	65.2	37.80	2,484		
Zone E, 2.95 Sk.	0.5	67.0	39.80	2,601		
Composite of Fractions	6.2	55.80	17.40	4,699	2.3	6.3
Refuse						
Zone D, 1.90 x 2.95	1.2	68.0	7.36	1,276		
Zone E, 2.95 Fl.	0.5	68.6	4.72	1,168		
Composite of Fractions	1.7	68.18	6.58	1,244	0.2	-
Composite of Table Fractions	100.0	13.99	4.09	12,828		

TABLE B-28. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING "UNCONVENTIONAL" THREE-SPLIT SEPARATION

Coal Identification: Baxter, Crawford County, Kansas

BCR Lot No. 2926

Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis: Ash	Chemical Analysis, Weight Percent, Dry Basis: Total Sulfur	Chemical Analysis, Weight Percent, Dry Basis: Calorific Value Btu/lb	Composite Wt. % of Available Calorific Value	% of Total Usable Product
Zone A (assumed 1.60 Fl.)	27.2	10.50	2.92	13,544		
Zone B (assumed 1.60 Fl.)	46.0	9.66	3.06	13,689		
Composite of Fractions	73.2	9.97	3.01	13,635	77.8	74.5
High Sulfur Combustor Feedstock						
Zone C, 1.60 Fl.	18.9	11.0	3.71	13,410		
Zone C, 1.60 x 1.90	1.1	35.5	10.40	9,266		
Zone C, 1.90 Sk.	3.5	63.4	13.80	3,072		
Zone D, 1.90 Fl.	0.4	14.6	4.40	12,877		
Zone D, 2.95 Sk.	0.7	65.2	37.80	2,484		
Zone E, 2.95 Sk.	0.5	67.0	39.80	2,601		
Composite of Fractions	25.1	22.06^{+}	7.09	11,258	22.0	25.5
Refuse						
Zone D, 1.90 x 2.95	1.2	68.0	7.36	1,276		
Zone E, 2.95 Fl.	0.5	68.6	4.72	1,168		
Composite of Fractions	1.7	68.18	6.58	1,244	0.2	-
Composite of Table Fractions	100.0	13.99^{+}	4.09^{+}	12,828		

TABLE B-29. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING DIRECT TWO-SPLIT SEPARATION

Coal Identification: Clements, Walker County, Alabama

BCR Lot No. 2928

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value
		Ash	Total Sulfur	Calorific Value Btu/lb	
Zone A (assumed 1.60 Fl.)	31.5	9.99	1.40	13,659	
Zone B (assumed 1.60 Fl.)	34.0	8.02	1.88	13,946	
Zone C, 1.60 Fl.	12.7	11.40	2.81	13,376	
Zone C, 1.60 x 1.90	1.6	41.20	3.83	8,262	
Zone C, 1.90 Sk.	1.9	77.30	2.10	2,207	
Composite of Fractions	81.7	11.57	1.88	13,362	97.2
Refuse					
Zone D, 1.90 Fl.	1.1	28.3	3.53	10,504	
Zone D, 1.90 x 2.95	13.5	83.3	1.50	1,167	
Zone D, 2.95 Sk.	0.2	70.3	30.60	3,336	
Zone E, 2.95 Fl.	3.2	84.9	1,84	888	
Zone E, 2.95 Sk.	0.3	68.5	35.80	2,876	
Composite of Fractions	18.3	79.89	2.56	1,731	2.8
Composite of Table Fractions	100.0	24.07	2.00+	11,234	

TABLE B-30. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING CONVENTIONAL TWO-SPLIT SEPARATION

Coal Identification: Clements, Walker County, Alabama

BCR Lot No. 2928

Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Chemical Analysis, Weight Percent, Dry Basis			Composite Wt. % of Available Calorific Value
		Ash	Total Sulfur	Calorific Value Btu/lb	
Zone A (assumed 1.60 Fl.)	31.5	9.99	1.40	13,659	
Zone B (assumed 1.60 Fl.)	34.0	8.02	1.88	13,946	
Zone C, 1.60 Fl.	12.7	11.40	2.81	13,376	
Composite of Fractions	78.2	9.36	1.84	13,738	95.6
Refuse					
Zone C, 1.60 x 1.90	1.6	41.2	3.83	8,262	
Zone C, 1.90 Sk.	1.9	77.3	2.10	2,207	
Zone D, 1.90 Fl.	1.1	28.3	3.53	10,504	
Zone D, 1.90 x 2.95	13.5	83.3	1.50	1,167	
Zone D, 2.95 Sk.	0.2	70.3	30.60	3,336	
Zone E, 2.95 Fl.	3.2	84.9	1.84	888	
Zone E, 2.95 Sk.	0.3	68.5	35.80	2,876	
Composite of Fractions	21.8	76.82	2.61^{+}	2,252	4.4
Composite of Table Fractions	100.0	24.07	2.01	11,234	

TABLE B-31. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING CONVENTIONAL THREE-SPLIT SEPARATION

Coal Identification: Clements, Walker County, Alabama

BCR Lot No. 2928

		Chemical Analysis, Weight Percent, Dry Basis				
Conventional or Low Sulfur Combustor Feedstock	Product, Weight Percent	Ash	Total Sulfur	Calorific Value Btu/lb	Composite Wt. % of Available Calorific Value	% of Total Usable Product
Zone A (assumed 1.60 Fl.)	31.5	9.99	1.40	13,659		
Zone B (assumed 1.60 Fl.)	34.0	8.02	1.88	13,946		
Zone C, 1.60 Fl.	12.7	11.40	2.81	13,376		
Composite of Fractions	78.2	9.36	1.84	13,738	95.6	93.9
High Sulfur Combustor Feedstock						
Zone C, 1.60 x 1.90	1.6	41.2	3.83	8,262		
Zone C, 1.90 Sk.	1.9	77.3	2.10	2,207		
Zone D, 1.90 Fl.	1.1	28.3	3.53	10,504		
Zone D, 2.95 Sk.	0.2	70.3	30.60	3,336		
Zone E, 2.95 Sk.	0.3	68.5	35.80	2,876		
Composite of Fractions	5.1	54.61	6.05	5,980	2.7	6.1
Refuse						
Zone D, 1.90 x 2.95	13.5	83.3	1.50	1,167		
Zone E, 2.95 Fl.	3.2	84.9	1.84	888		
Composite of Fractions	16.7	83.61	1.57	1,114	1.7	-
Composite of Table Fractions	100.0	24.07	2.01	11,234		

TABLE B-32. POTENTIAL COMBUSTION USE OF SELECTED COAL FRACTIONS USING "UNCONVENTIONAL" THREE-SPLIT SEPARATION

Coal Identification: Clements, Walker County, Alabama

BCR Lot No. 2928

		Chemical Analysis, Weight Percent, Dry Basis				
Low Sulfur Combustor Feedstock	Product, Weight Percent	Ash	Total Sulfur	Calorific Value Btu/lb	Composite Wt. % of Available Calorific Value	% of Total Usable Product
Zone A (assumed 1.60 Fl.)	31.5	9.99	1.40	13,659		
Zone B (assumed 1.60 Fl.)	34.0	8.02	1.88	13,946		
Composite of Fractions	65.5	8.97	1.65	13,808	80.5	78.6
High Sulfur Combustor Feedstock						
Zone C, 1.60 Fl.	12.7	11.4	2.81	13,376		
Zone C, 1.60 x 1.90	1.6	41.2	3.83	8,262		
Zone C, 1.90 Sk.	1.9	77.3	2.10	2,207		
Zone D, 1.90 Fl.	1.1	28.3	3.53	10,504		
Zone D, 2.95 Sk.	0.2	70.3	30.60	3,336		
Zone E, 2.95 Sk.	0.3	68.5	35.80	2,876		
Composite of Fractions	17.8	23.78	3.74	11,257	17.8	21.4
Refuse						
Zone D, 1.90 x 2.95	13.5	83.3	1.50	1,167		
Zone E, 2.95 Fl.	3.2	84.9	1.84	888		
Composite of Fractions	16.7	83.61	1.57	1,114	1.7	-
Composite of Table Fractions	100.0	24.07	2.01	11,234		